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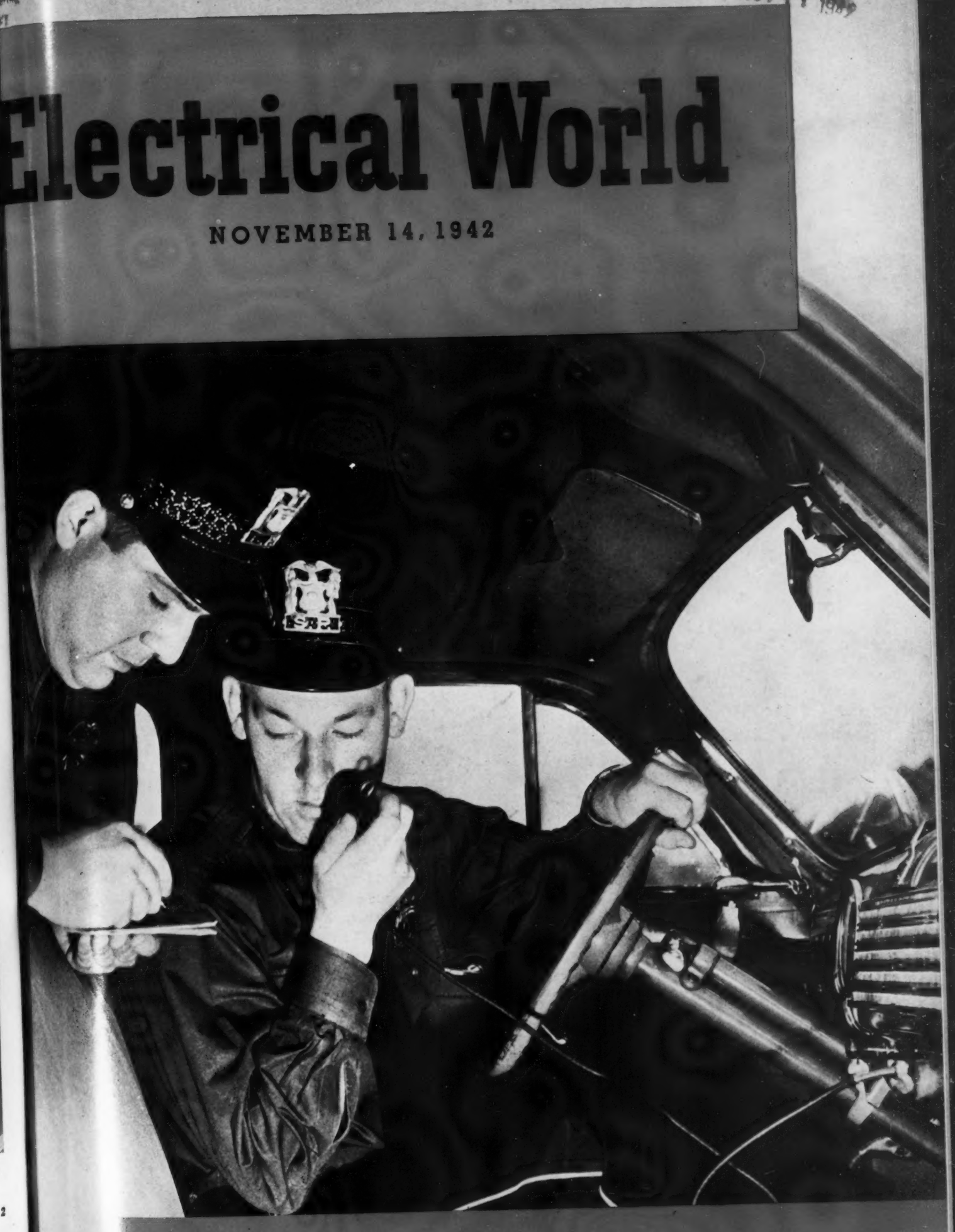
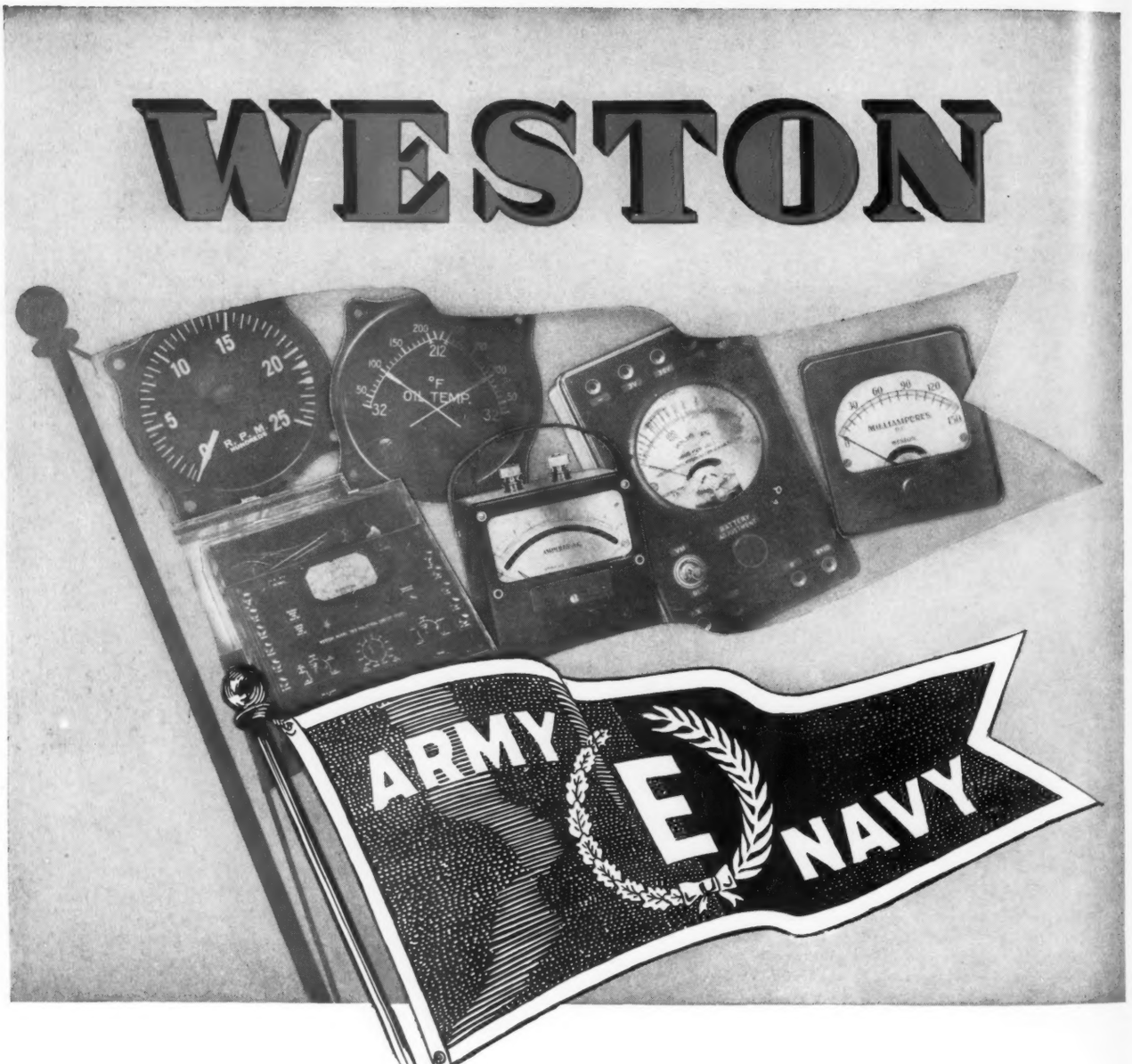
Electrical World

NOVEMBER 14, 1942



SPECIAL POLICE IN UTILITY DEFENSE CORPS



Receives the Army-Navy "E" Award

"On LEADERSHIP rests the responsibility for getting things done."

Only short months ago, the instrument goal in this mechanized war seemed unattainable. In almost unbelievable quantities instruments were needed for our huge plane program—for a two-ocean navy—for tanks, guns and walkie-talkies — for our arsenals and factories — and for countless new devices of war.

To approach this goal meant far more at WESTON than the mere addition of factory and laboratory equipment, and the usual worker-training program. It meant imparting to untrained hands the skill and instrument sense which ordinarily takes years to acquire. For it's this rare instrument sense, backing up sound engineering, which has been responsible for WESTON's continued leadership.

This "E" award to the workers at WESTON—the first to any group in this specialized field—means recognition of their efforts in striving to attain the goal in numbers, while never relinquishing the WESTON quality ideal.

And to our courageous fighting men everywhere, it conveys the assurance that they can depend on the men and women at WESTON to continue furnishing the essential instruments in ever increasing quantities . . . *until victory is won.*

WESTON ELECTRICAL INSTRUMENT CORPORATION, NEWARK, N. J.

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 68 YEARS

November 14, 1942

Vol. 118, No. 20

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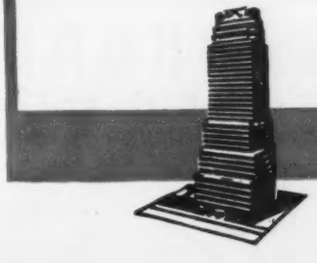

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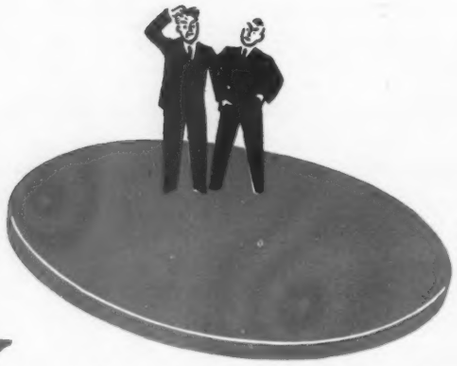
We're Both on the Spot



Your problem is to transmit the greatest block of electric power, or to transport the greatest volume of traffic, or to produce the greatest quantity of material that you have ever been called upon to handle.

Our problem is to supply insulated wire and cable for the war effort and, at the same time, supply other vital needs within the limitations imposed upon us. Although our plants are running day and night to meet these demands, production is, at times, insufficient to meet other than war requirements.

We're both on the spot! If we occasionally fail to maintain prompt deliveries, we must all be patient! We are all devoting our energies to one objective—the winning of the war—but we must first follow instructions from those responsible for the direction of America's war effort.

Today, as always, we are interested in your cable problems and are glad to discuss them. Our Research and Engineering departments are developing new ideas daily and one that eliminates the use of vital war materials may be just the solution to a problem you have. May we suggest, therefore, that before placing an order for cable or wire, you consult our representative as to your needs, so that we may be more certain of filling your order and possibly expediting its delivery.

THE OKONITE COMPANY
Passaic, New Jersey
Offices in Principal Cities

OKONITE
Insulated Wires and Cables

"BUY U. S. WAR BONDS—Every Payday All Okonite Employees BUY U. S. WAR BONDS"

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! *For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.*

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the *first* to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their $1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a $10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.

President, McGraw-Hill Publishing Company, Inc.

No Ballot Box Cures

Tuesday a week ago was a great day for the Republicans. Was it also a great day for private initiative? Many a business man, including not a few public utility people, looked upon the election results as an omen of victory.

In a sense they were right, for certainly the voters made it evident that they were dissatisfied with some of the political maneuverings that impeded the war program. Would the voters have been equally provoked at these same tactics had there been no war?

Some see in this election a parallel of the action taken at the polls in the middle of the Wilson war administration and predict two years from now a political upheaval similar to that which swept the reactionary Harding administration into office after the last war. They may be right, but time alone will tell.

In the meantime it would be most unwise to start counting chickens, for at this time even the eggs haven't been laid. Instead the wisest course to follow would be to put one's house in order so that if those opposed to free enterprise meet further defeat it will not be difficult for friends to remove or soften some harsh regulatory legislation.

Elections do not cure ills, but ills do cause some election results. The new Congress may be less sympathetic to anti-business measures, but it is not going to jump in at once and wipe out the record of the past ten years.

There can be no question about the public dissatisfaction with unfair business practices operating against competition, labor and the public good. The New Deal has to a degree been the symbol of this discontent which will last, regardless of how elections may go, until business removes the source of the complaint.

A great many freedoms that business enjoyed before the New Deal will never be returned. Most of the restraints and regulations will remain in effect. How severely they will be administered will depend in large measure upon the good faith and actions of business.

There is, however, this ray of sunshine out of the political reversal. With a Congress that is more independent of the White House it should be possible for business to make a move without looking backward to see if some one were about to attack it. Business should find a greater tendency on the part of Congressional hearings to listen sympathetically to its case and less attentively to the pleadings of bureaucrats.

And what is of greatest importance, Congress will probably insist that agencies which have been set up to regulate business operate within the law and not as independent law-making bodies.

The election is indication positive that the American people are opposed to dictatorial government. The trend toward regimentation, political favoritism, reckless spending, disregard of law and other forerunners of dictatorship has been called to a halt. Yes, it was a great day for the Republicans, but a greater day for free enterprise.

Utilities Are Getting in the Scrap

A survey of the methods and results from 76 companies shows intensive attention to scrap, with poundage this year double previous years

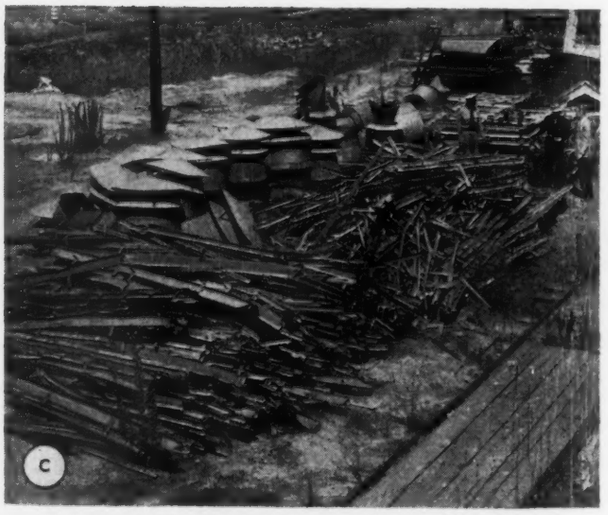
IN THE first eight months of this year 76 electric utility companies disposed of more than 62 million pounds of scrap, or an average of nearly a million pounds per company. Since many companies indicated that the collection in the remaining four months of the year would be at a substantially faster pace than in the earlier months it is reasonably certain that these same 76 companies will go over 100 million pounds of scrap before the end of the year.

In spite of the fact that most utilities are careful to keep their systems clean of obsolete and unused equipment the collections this year will more than double those of previous years. For, as shown in the accompanying tables, both in 1941 and in 1940 the utilities scrapped around 50 million pounds.

In examining these figures one must keep in mind that they are not strictly comparable. In some cases companies furnishing 1942 figures were unable to report for 1940 and 1941 because records were unavailable. In other instances the companies reported for 1940 and 1941, but said it was too early as yet to give the 1942 figures for the first seven or eight months.

Most companies early this year developed a special program for finding and handling scrap. Some of these in the large systems were operated by committees made up of department executives. Mostly, however, one man was given the job, frequently the storekeeper.

Employees were asked to help in these programs, one company, New Orleans Public Service, going so far



SOME OF THE UTILITY SCRAP COLLECTIONS—(a) Transformers, Metropolitan Edison. (b) Cable, Washington Water Power. (c) Iron, Southern California Edison. (d) Rubber, San Diego Gas & Electric. (e) 7,500-lb. mud cat, Arkansas Power & Light

Itemized Weights of Copper, Steel, Rubber and other Metals and Materials Disposed of as Scrap in 1940, 1941 and Eight Months of 1942

76 companies supplied figures from which this tabulation was made

A—Metals	Lb. 1940	Lb. 1941	Lb. Jan.-Aug. 1942
Aluminum	182,162	250,451	82,403
Brass and bronze	504,732	1,041,198	643,326
Copper	8,388,446	10,743,103	6,693,214
Iron and steel	37,336,061	35,214,569	44,544,213
Lead	1,559,172	1,769,297	1,608,328
Paper	1,775,260	1,732,650	1,917,830
Rubber	198,536	171,157	471,767
Zinc and tin	9,521	15,835	23,434
"Ferrous material"	.....	.....	3,389,146
"Non-ferrous material"	9,095	23,033	411,433
Miscellaneous	**852,624**	**861,737**	**468,900**
Aluminum, cable, sheet	61,729	83,218	10,399
Aluminum, steel core	16,000	846	4,011
Aluminum, cable, ins	1,263	120	.....
Brass, with iron	10,946	8,639	4,753
Brass—Zinc	20,455	15,277	23,910
Copper alloy	.....	.....	10,784
Copper nickel alloy	.....	.....	56
Copper, insulated	73,314	58,590	27,450
Copper with iron	242,823	136,035	55,054
Copper, lead covered	14,000	14,597	4,380
Lead, over 40% tin	3,631	72,885	1,83
Lead, up to 39% tin	.....	28,702	1,938
Lead, under 10% tin	.....	7,242	.....
Lead, copper and insulation	2,598	.....	25,731
Lead and brass breakage	.....	.....	397
Mercury	65	.....	.....
Metal, babbitt	1,700	846	5,843
Metal, mixed	6,829	3,675	5,092
Metal, monel	496	1,850	.....
Metal, scrap	.....	.....	27,500
Metal, stereotype	1,321	454	267
Metal, mixed, mixed scrap	395,326	401,761	205,098
Nickel	128	.....	.....
Scrap, rail, etc	.....	.....	50,772
Silver, German	.....	.....	735
Solder	.....	.....	2,900
Grand total, 76 companies	50,815,609	51,823,030	60,254,044

B—Equipment	1940	1941	1942
Aluminum breakage, incldg. ACSR wire	116,000	.....	.....
Assemblies, brass—copper	2,178	1,291	400
Batteries	3,020	7,112	5,550
Batteries, auto	42	87	60
Batteries, elec. locomotive	1,776	.....	.....
Batteries, storage	.....	.....	1,232
Blades, turbine	.....	.....	1,490
Bolts	.....	16,776	.....
Breakage	5,256	597	1,539
Breakers, oil circ	25,820	.....	.....
Brick, burned	.....	22,900	38,000
Burlap	215	161	35
Cable, armored	6,510	14,520	9,210
Cable, aluminum	.....	.....	8,826
Cable, lead	1,388,558	837,287	768,880
Cable, lead cover	266,454	348,902	130,059
Cable, lead-cov. copper	59,970	123,387	.....
Cable, lead and copper	115,175	53,307	17,112
Cable, mast arm and tree wire	9,383	9,840	4,560
Cable, lead, copper, steel and insulation	99	241	1,893
Cable, steel	.....	.....	3,840
Coils, armature	1,967	1,340	1,630
Crane, elec. locomotive	.....	71,280	.....
Cords, appliance	126,043	75,687	.....
Cores, transformer	29,415	30,530	5,778
Dross, solder	.....	.....	615
Fans	47,957	37,440	11,090
Fibre	242	.....	.....
Foil	.....	.....	25
Grates	107,270	122,805	132,275
Laminations	.....	.....	10,500
Lamps, arc	.....	49,300	.....
Linite	.....	.....	75
Meters	5,691	5,691	30,800
Meters, electric	5,803	5,781	2,924
Meters, gas	17,115	13,480	.....
Meters, watt-hour	14,000	38,000	25,660
Meters, scrap	.....	12,995	.....
Motors	110,137	99,251	40,020
Miscellaneous	.....	.....	560
Parts, mixed auto	.....	.....	685
Pipe, C. I. steel	.....	.....	13,960
Plates, lead electroplate	.....	365	.....
Plates, lead battery	29,690	26,160	.....
Potheads	2,837	2,520	605
Pumps, slag	.....	6,340	.....
Radiators, auto	.....	24	268
Rags	.....	.....	882
Ranges, coal	.....	.....	380
Rope, manila	.....	.....	300
Rope	907	4,825	5,452
Rope and burlap	6,624	12,218	.....
Shoes, brake	29,080	11,810	4,545
Slag	7,320	23,750	.....
Stoves, gas	.....	.....	16,550
Stove parts, gas	.....	.....	11,090
Sweepings, meter	.....	.....	3,238
Thimbles, lead	.....	.....	50
Transformers	11,080	13,030	6,242
Transformers, distrib	48,684	47,562	25,830
Transformers, inst	.....	.....	893
Transformers, iron	3,146	2,190	48
Transformers, junk line	70,155	37,315	.....
Tires, auto	5,560	4,900	6,210
Tubes, boiler	625	37,285	.....
Tubes, brass condenser	.....	.....	27,561
Tubes, condenser	709	.....	.....
Tubes, munz metal condenser	.....	160,000	66,323
Wire rope	5,410	.....	.....
Wire, copper (incl. insulation)	51,420	51,994	14,760
Wire, copper and steel	.....	.....	457
Wire, copper iron clad	6,421	10,566	3,165
Wire nichrome	3,169	3,226	1,384
Wires, filament	.....	.....	390
Wire, resistance	.....	.....	259
Wire, weatherproof copper	271,300	240,000	79,000
Wire, scrap guy	.....	31,390	8,200
Wire, insulated	695,627	245,930	148,950
Wire, magnet	1,456	1,139	77
Wheels	88,000	.....	.....
	3,804,956	2,974,527	1,702,387

as to develop a special scrap collection sound slide film to show employees in small groups under a conference leader. Another company, Commonwealth Edison, spurred employees on with a banner which went the rounds to the department with the best scrap record.

In almost every instance a survey was made of all property and in a number of instances continuing surveys are being made at regular intervals ranging from two weeks to four months.

These surveys have brought to the junk pile such major items as power houses, waterwheels, boilers, bridges, abandoned electric railways, mills and underground d.c. cable.

Former practice of leaving obsolete equipment in place when removal costs exceeded scrap value are being discarded in view of today's need for metal. Near-obsolete equipment is not being kept to the same extent as formerly.

It was interesting to note the large number of utility executives and employees who were taking some part in the organization of their community scrap drives all the way from state chairman (Maine) down to members of local committees. A great many companies devoted their advertising space to the campaign and several companies reported that they had placed their trucks at the convenience of the local committee.

In almost every instance employees were exhorted to "get in the scrap" at home, and in a few instances companies attempted to help industrial customers locate scrap.

While utilities are reporting their scrap sales monthly to WPB, these tables are shown to indicate the large measure of cooperation of electric companies in the war effort.

Carrier Telephone Saves Distribution Labor and Travel

Year's experience shows large gains for a small expenditure for 80-kc. modified police radio system applied to rural feeders in Maryland area

W. C. FEASTER, Technical Engineer, Potomac Edison Company, Hagerstown, Md.

A RECENT INSTALLATION of carrier-current telephone equipment by the Potomac Edison Company of Hagerstown, Md., has satisfactorily solved the problem of obtaining reliable communication to line trucks operating in an area served by a rural distribution system. A transmitter and receiver were installed at a substation serving a 12-kv. grounded neutral distribution system covering a territory of approximately 415 square miles and consisting of about 462 circuit-miles. Battery-operated receivers and transmitters, along with suitable coupling devices, were installed in the line trucks.

Selection of a carrier-current system in preference to a radio system was made after consideration of the advantages of each system as applying to local conditions. The problem is to supply continuously reliable communication from the dispatching point to the trucks, also to have available communication from the trucks to the local dispatching point when needed. The truck crews can then be given instructions as to the handling of emergency or special jobs quickly and efficiently. When switching is necessary the proper reports can be made and interruptions and delays reduced to a minimum.

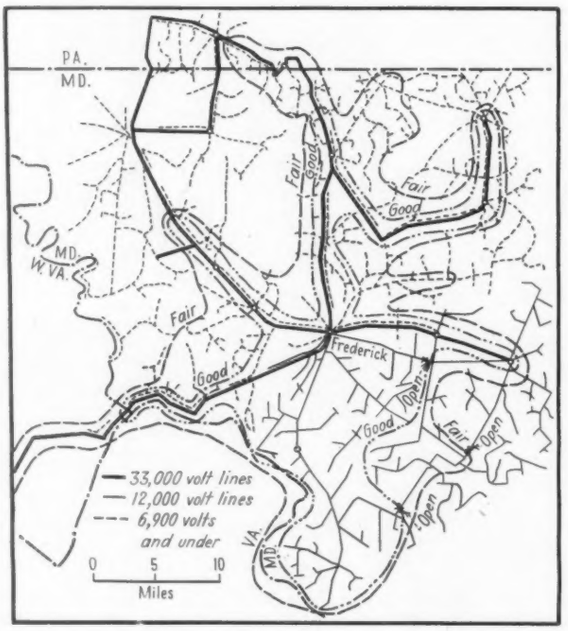


FIG. 1—Circuits close to roads

The 12-kv. system to which the substation transmitter is connected is shown by solid lines. The most remote point is 22 airline-miles and 27 circuit-miles from line headquarters and substation at Frederick. Circuits feeding from other sources are shown by broken lines. Reception is indicated as "good" or "fair"

Carrier More Advantageous

A carrier system meets the requirements and has several advantages. Under the rules of the FCC it does not require a license due to its low radiation range; a reasonable workable signal cannot be obtained more than 300 ft. from the nearest line. An expensive antenna system is not required and hills have no effect on signals. Unlike radio, which is licensed only for emergency use, carrier can be for normal operation. It offers no opportunity for communication outside a limited area. This is certainly an advantage during wartime from the standpoint of espionage. There is also normally little possibility of interference with or from other systems as exists in radio due to the crowded channels. Carrier can also be used for remote control of switches in the distribution system.

A carrier system does have several disadvantages: (1) It is useful only within less than 300 ft. of overhead lines; (2) when talk back is required it is necessary to hook up to the line, and (3) opening of switches in the distribution system will affect the area over which communication is possible. Switches can, however, be bypassed when necessary at a reasonable cost. There is some possibility of interference with the low-level carrier systems on parallel telephone or telegraph lines if such systems are used in the vicinity. This possibility is not very great, but should be checked.

On the Potomac Edison System most of the circuits (Fig. 1) are either on the road right-of-way or close to it. Therefore, the trucks are nearly always located close to the lines and within range of the signal.

Well-designed receivers are necessary for a successfully operating carrier system. Those on the Potomac Edison System are standard Link intermediate-frequency receivers, of the type used for police systems, converted for 80 kc. operation at slight additional cost (Fig. 2). They are superheterodynes with crystal-controlled oscillator, automatic volume

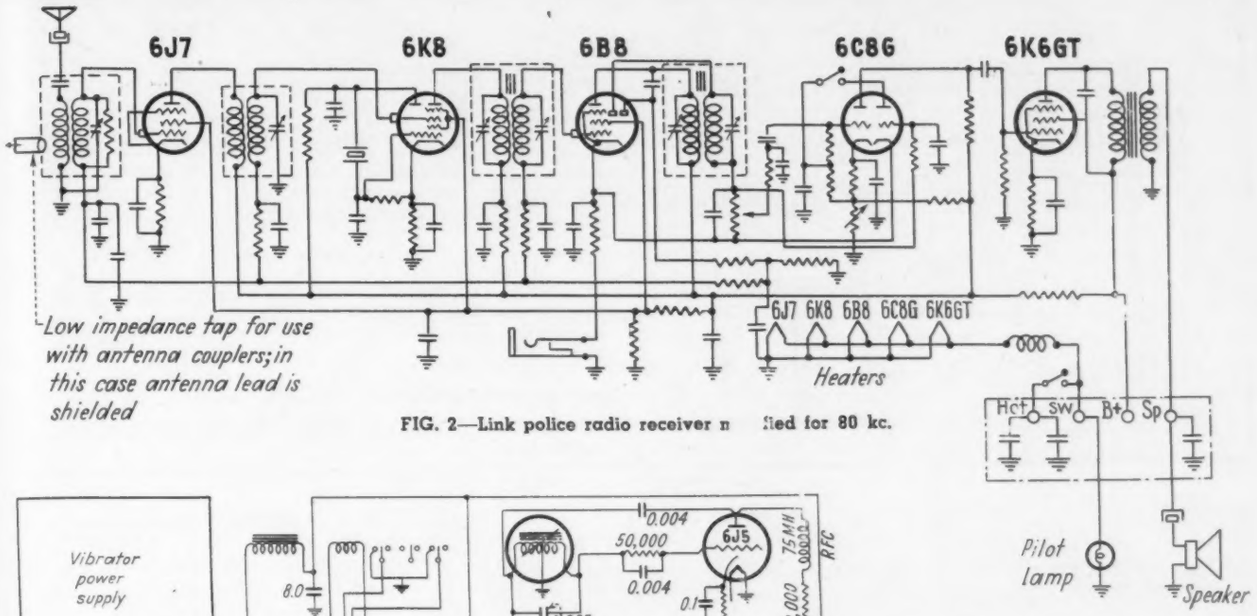


FIG. 2—Link police radio receiver n fied for 80 kc.

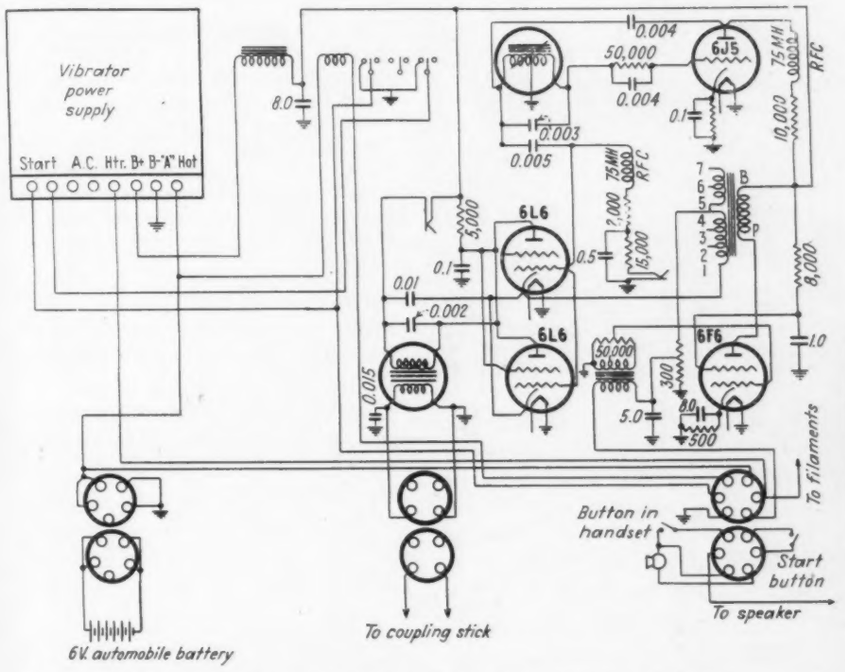


Fig. 3—20-watt transmitter consists of an oscillator driving two type 6L6 tubes as amplifiers operating in parallel. Cathode modulation and a vibrator-type power supply is used. Microphone current is obtained from a tap on the cathode bias resistor of the amplifier tubes

FIG. 4—Coupling equipment applied to rural line; coupler, shown at right, consists of fuse, capacitor and transformer units

control and a well-designed "squelch." A standard 6-ft. whip-type antenna is used at all times and supplies plenty of signal to the receiver. The power supply is furnished by a dynamotor which is carefully filtered. The battery drain is 6 amps. Receiver and speaker are mounted on the bulkhead between the cab and motor. In this position the volume control and switch are readily accessible.

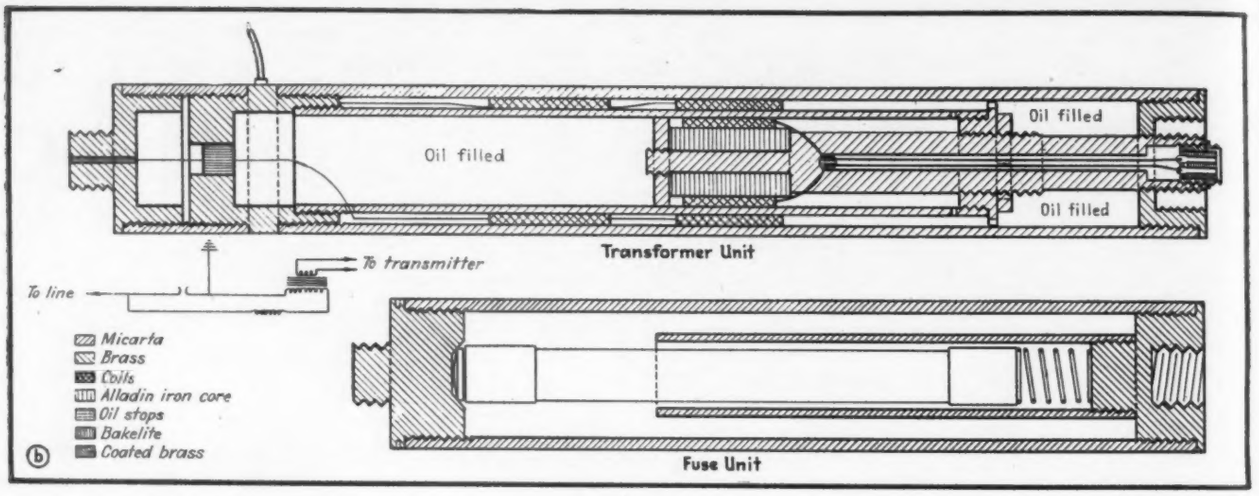
Noise suppression on the car is somewhat more difficult for carrier frequencies than for broadcast frequencies. In general, the same technique should be used, but much larger filter capacitors are required. Normal size spark plug suppressors have always been satisfactory.

Transmitter supplies approximately 20 watts into the line (Fig. 3). Tuning is accomplished by changing the position of the iron cores in the inductance coils. The transmitter is controlled by starting and stopping the vibrator unit. A relay mounted on the transmitter chassis is used for this purpose, as well as for shorting the receiver speaker while the transmitter is operating.

The portable transmitters are coupled to the line, either phase to phase or phase to ground, by means of a coupling stick (Fig. 4), which consists of fuse, capacitor and transformer units (Fig. 5). An additional stick is used for connection to the ground or second phase. A coaxial cable connects the transformer unit to the transmitter.

Capacitor unit is $2\frac{1}{2}$ in. in diameter and $8\frac{1}{2}$ in. long, weighing 3 lb. It is an oil-filled paper capacitor of 0.004 mfd. having a continuous rating of 7,500 volts at 60 cycles, and in turn is coupled to the transformer unit.

The transformer unit, which is $16\frac{3}{4}$ in. long and weighs $5\frac{1}{2}$ lb., consists of



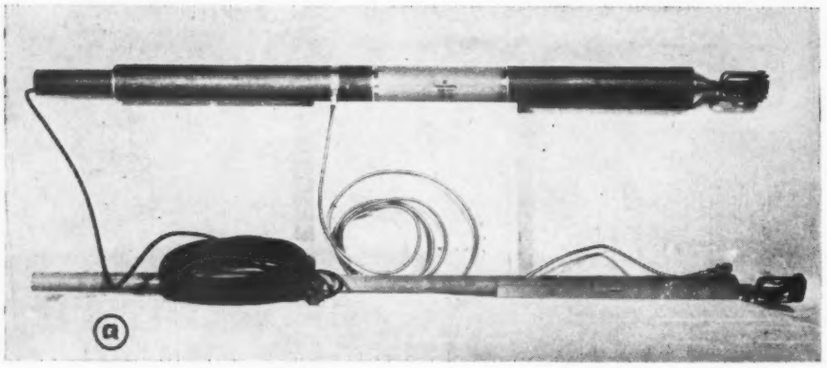


FIG. 5—Transformer and fuse units of the coupling stick

(a) Three units combined in one with spring clamp for line attachment.

(b) Fuse unit consists of a 2½-in. micarta tube which incloses a 7,500-volt liquid-type fuse of 1-amp. rating; fuse held in place by metal fitting which screws into micarta tube and also couples into capacitor unit. The unit is 12 in. long and weighs 2 lb.

an inclosed protective gap, a connection for ground or other phase, a tuning coil and an oil-insulated transformer, the secondary of which is connected to the cable leading to the transmitter. The gap is connected across the tuning coil and transformer primary and is a protection for these coils.

The transformer is used to supply reliable isolation between the high voltage of the distribution system and the transmitter. It is tested at 50 kv. for breakdown between the primary and secondary windings. The actual breakdown voltage is much higher.

This coupling unit is used on distribution systems of voltages up to and including 12 kv. with grounded neutral. On the 12-kv. system it is connected only phase to ground with the ground being connected first. On the 6.9-kv. and 2.3-kv. systems either phase to phase or phase to ground connections are used, although the latter is preferred.

Substation Set

The substation set which is used for paging and dispatching is essentially the same as the truck sets. The a.c. power supply for the transmitter gives a higher plate voltage and therefore a somewhat higher output is obtained. The transmitter is coupled phase to ground on the 12-kv. station bus, while an antenna is used for the receiver.

Both the substation and truck sets are operated simplex, it being necessary to push a button to talk. Calling and listening is done by means of the loudspeaker, which is normally held quiet by the "squelch" circuit in the receiver. This means that no

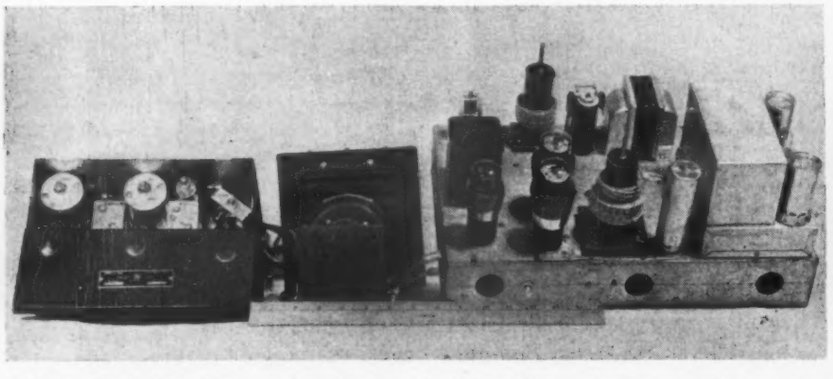


FIG. 6—Transmitter (right) and receiver (left) with speaker and power supply in center

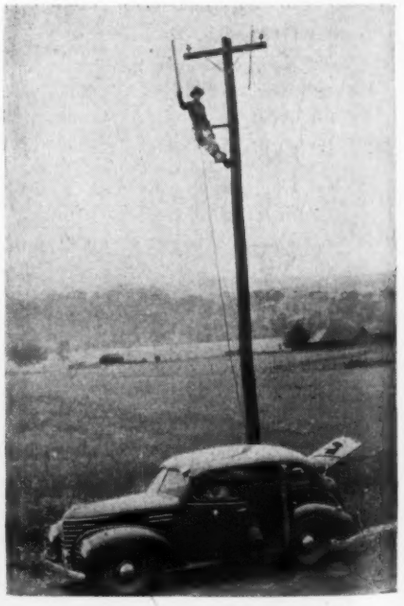


FIG. 7—Portable carrier equipment being used by district line superintendent for communication with a line truck

noise is heard unless there is a carrier transmitter sending a signal. This is important from the standpoint of the occupants of the truck cabs.

Frederick substation is supplied by three 33-kv. circuits and has three distinct distribution systems radiating from it, all of which are covered by the signals.

Due to line parallels, the 6,900- and 2,300-volt systems feeding out of Frederick are completely covered by workable signals and two-way communication is possible.

Coupling Adequate

The 12-kv. system to which the carrier is supplied serves a territory principally to the south and east. This system is completely covered by the carrier so that signals are practically always received and communication back to the substation is very reliable. Very little trouble has been experienced from reflections, as the result of taps on the distribution system. Most of these taps are single phase and if shorts to the 80 kc. occur the two other phases carry the signal by the point of the tap. One point on a short single-phase line has been found where a tap causes a loss of signal beyond.

There is sufficient coupling between the 12-kv. and the 33-kv. systems through the transformers and parallel lines to give good signals along the 33-kv. lines within 35 miles of Frederick. Coupling between the 33-kv. and the distribution systems in towns within 25 miles of Frederick is such that it is nearly always possible to call trucks working in these towns or along distribution lines within 2 or 3 miles of the local substation.

Trucks located within the area inclosed by the contour (Fig. 1) marked "good" can always be expected to receive the signal when near a line. Within the area inclosed by the contour marked "fair" there are points where the signals are weak and it is necessary to pull under the line to obtain good communication. There are dead spots and weak signals within the remainder of the area.

Normal paging procedure is for the substation to call the desired truck at about five-minute intervals until a reply is received. Under this system any truck inside the "fair" contour will answer 95 percent of the time in less than 15 minutes. A truck will answer about 50 percent of the time in remainder of the area shown.

Lightning storms cause considerable noise, but the signals are usually so strong under the lines that they over-ride the static. It is only necessary to pull under the line in order to get a message. Normally the truck sets will not be coupled to the line during severe storm conditions.

During several recent snow and wind storms the carrier has been the only communication available. The distribution system is built with a higher factor of safety than most communication circuits and will stay up longer. Unless all of the wires are broken at one point the signal will be carried on through the break. Both of these factors tend to make the system reliable in emergencies.

During normal operations made necessary by maintenance or construction work, it is frequently possible to reduce the time of interruptions considerably. When it is necessary to remove a section of line from service it is possible to place men at the switching points and communicate with them from the job location. This greatly reduces the amount of driving necessary and saves time. For short distances it has even been possible to talk along grounded lines due to the impedance in the grounding circuit.

This carrier system has been in operation for more than a year with very satisfactory results. The coverage has been considerably better than anticipated and the reliability satisfactory. Carrier does not do a 100 percent job, but it is believed that the saving obtained in labor and transportation has more than justified the small investment involved.

Plant Maintenance Geared to War Loads

Turbines dismantled on both calendar and operation-duration bases — Boilers generally overhauled annually — Fuel-handling and auxiliaries maintained when necessary or on light-load periods — Intervals lengthened for some major equipments

STATEMENTS by typical utilities indicate that war plant loading has been increasing in magnitude or duration, but not to the point where it is not possible to keep the steam station equipments in good state of maintenance to carry the demands upon them. This is particularly true of systems having hydro capacity of their own or being parts of interconnections carrying hydro. On the contrary, one company says: "We do not see prospects in the near future of having sufficient reserve to permit handling maintenance and inspection as we might wish."

On the whole, however, it does not appear that war loads for many companies have reached the stage where drastic changes have been necessary in overhaul and inspection programs. The events of 1941 prompted anticipatory examinations and repairs which bid fair to carry well through the normal periods of operation without extensive scheduling of overhaul at shortened intervals.

Overhaul Periods

One question asked was:

What has been the customary interval or period of the year at which you inspect and overhaul major equipment—(a) turbines, (b) boilers, (c) condensers, (d) fuel handling, (e) other plant equipment.

Widely varying answers to this question are attributable to varying types of equipment, fuel, system setups, number of stations, availability of hydro, etc. Some companies authorized identification, but others asked for obscurity, so all are designated merely by letters:

(A) We have always inspected our

turbines and condensers annually and given them a complete overhaul every three years. Boilers and fuel-handling equipment are looked over at week-ends every three or four months and thoroughly overhauled once a year. Other plant equipment is looked over carefully every six months and overhauled when the main apparatus is down for overhaul.

Inspections and Overhauls

(B) Our normal maintenance schedule calls for a turbine inspection and overhaul at two-year intervals. Boilers at one plant are given inspections and minor repairs once a year and are completely overhauled at four-year intervals. Capacity is sufficient to spare two boilers at any time without curtailing output. Boilers in other plants are carefully checked annually, defective parts replaced. Refractory repairs, etc., are such that our average boiler availability is about 92 percent. Condensers are inspected and overhauled at the time of turbine overhaul. Fuel-handling and other equipment is closely watched and defective parts replaced as soon as noticed. No period of major overhaul is scheduled for such equipment because a program of preventive maintenance is followed.

(C) During the first six months of the year full hydro capacity is normally available; most of the maintenance is carried out then.

(D) Our overhaul period is from March to July, when there is usually good stream flow and less steam is required to carry the load; in previous years the total system load also declined during this period.

(E) Turbine and condenser inspections (usually in April, May, October or November) after each 9,000 hours of service. Pulverized-fuel boilers inspected annually during May or June. Stoker-fired boilers inspected and overhauled as and when they need attention; inspection intervals range from one to five months.

(F) Main turbine units normally scheduled for inspection and overhaul every two years, the time depending on status at run-of-river hydro plant, generally from May to October, but possibly any month of year. Newest boilers same time as associated turbine. Older boilers, on common header, scheduled for routine maintenance on a combination of elapsed-time and coal-burned basis; condensers inspected with turbines, unless necessary in intervening period, when one-half is cleaned at a time while carrying load or entirely during an overnight shutdown. Fuel handling installed with sufficient excess capacity and duplication to permit necessary repairs without shutting down any part of the station.

(H) Customary overhaul period May to October.

(I) Reserve capacity limited so that it is impossible definitely to schedule overhaul of major equipment. Customarily done during summer months. Usually done with thought that it may be impossible to open a machine in the succeeding year due to load growth. Rarely have found it imperative that a major generating unit must be overhauled in any given year. In one instance we operated a turbine for three years without examining it and at the end of that period found it to be in excellent condition.

Boilers are usually given summer overhauls, but, owing to the usual small ratio of each to plant total, it is possible to start the program earlier than the turbine program and carry it on later into the fall.

(J) Turbines after 10,000 hours of service; boilers when they need it; condensers retubed about every five years.

(K) Steam turbine thoroughly inspected annually and major overhauls made about once in three years (spring months, on account of load dip and abundance of hydro). Boilers overhauled with their turbines. The most common cause of condenser repairs is leaky tubes, and usually these may be fixed during the night.

(L) Turbines, once a year, boilers six to ten weeks; condensers very seldom require attention; fuel handling, no definite schedule, repairs when necessary.

(M) In the past it has been our practice to schedule the inspection and overhaul of major equipment during the first six months of the year, when stream flow hydro is usually the greatest and system load the lightest. Week-end conditions have no effect as each major unit requires from one to four weeks outage. Week-end outage for maintenance of fuel-handling equipment.

(N) Since December 1, 1941, our principal steam stations have been required to operate at practically full load for seven days a week, older stations from six to seven days, depending on load conditions and water conditions at hydro plants. Our normal inspection schedule previous to the emergency was as follows: High-pressure turbines, internal inspection after 8,000-12,000 hours operation; high-pressure boilers, internal inspection after three months continuous operation; condensers, complete inspection coinciding with corresponding turbine inspection; low-pressure boilers, spares permit continuous rotation of inspections; low-pressure turbines, internal inspection after 8,000 hours inspection.

(O) Turbines 22,000 to 28,000 hours; boilers, 1,000-1,600 hours; condensers, water boxes at least once a month and tubes and internal parts every three months.

(P) Seasonal load makes question hardly applicable.

Stepped-up Inspections

To bring out the effect of any curtailed opportunity for maintenance because of growth of week-end loading the following questions were asked:

What measures are you employing to meet the situation occasioned by curtailed opportunity for maintenance because of growth of week-end loading?

(a) Longer intervals between routine inspections,

(b) Rearranged schedules of maintenance,

(c) Enlarged maintenance force,

(d) Use of what mechanical aids to expedite the jobs,

(e) Installation of what preventive equipment,

(f) Installation of what duplicate facilities?

Or do you have (or expect to have shortly) sufficient reserves to be able to follow your customary practice as to inspection and maintenance?

It appears that some utilities have had to make relatively few changes in their programs of scheduled maintenance partly because of the good conditions to which equipment had been brought in the anticipatory period, partly because of sufficient margins of reserve and partly because war loads in most areas are not a dominant part of the total load.

(A) We have not had to alter our scheduling because run-of-river hydro supplies about one-third the capacity required on peak. During February-May (and occasionally into late June)

we can take out two boilers (25,000 kw.) at a time.

(B) Since ours is a combined hydro-steam system in which steam-plant loads have, at times of low hydro, been almost as heavy on week-ends as during the week, we have developed a two- or three-shift maintenance schedule which has permitted full-time operation of steam turbines at close to full-rated capacity without resort to heavy maintenance on week-ends. If heavy week-end loads should curtail our maintenance program we will resort to larger maintenance crews on the night shift and "around-the-clock" operation of other equipment. Due to recent and prospective additions to generation we are experiencing no difficulty in meeting maintenance requirements.

On Seven-Day Week

(C) A large part of the war industries in our area are on a seven-day week basis and casual inspection would indicate that placing the remainder on the same seven-day basis would not increase the week-end load to such a degree as to prohibit routine maintenance and inspection.

(D) The only way that our regular program for maintenance could be affected under heavier week-end loading would be an inability to purchase power under present arrangements. There is ample power in the district if it is distributed equitably.

(E) Longer intervals between routine inspections of certain equipment and nightly inspection of smaller equipment. Inspection and maintenance on larger equipment scheduled during holiday periods. It has not been necessary, however, to increase the maintenance forces nor provide additional mechanical aids to expedite repair nor to install preventive equipment.

(F) Maintenance forces have had to be enlarged and worked overtime in order to make the necessary repairs with the least possible effect on service. Our entire schedule of maintenance is based primarily on the performance of run-of-river hydro which constitutes half the capacity required on the annual peak.

(G) We have been able to do the necessary regular maintenance work at night and over the week-ends. We expect to have sufficient capacity available on our system or through interconnections which will permit the necessary maintenance operations.

(H) We have had to lengthen the intervals between inspections and overhauling periods for major plant equipment. We had anticipated either a war or greatly increased defense production and have gone over all plant equipment and put it in as good a condition as possible. Maintenance work normally done over the week-ends is now taken care of by increasing the night maintenance crews by transfer from day crews. We have sufficient reserves to follow our customary program of major inspections and overhauls during 1942.

(I) Longer intervals between turbine inspections and duration of inspections of both boilers and turbines shortened by resort to an increased number of shifts. We have made it a policy to adopt mechanical aids which shorten the overhaul period; in this connection pneumatic wrenches are of particular value, both on boiler and turbine work.

(J) We are meeting the situation by a combination of the measures enumerated in the question. Intervals between inspections have been lengthened somewhat. Additional mechanical aids to expedite overhauling will be used as their worth becomes apparent; use of such aid has been prevalent, however, for several years.

(K) We have not found that a longer work-week has materially affected our maintenance program. Shortage of materials is proving a more serious interference.

(L) Week-end loading is still materially less than that occurring during the rest of the week. The conditions are necessitating slightly larger maintenance forces and more overtime work.

(M) There are no indications that the trend toward a seven-day work-week of war industries has necessitated any significant change in our routine maintenance schedules. Demand on our present generating facilities by local war industries does not constitute a majority of the whole, and even if it should increase considerably we do not believe the effect on present maintenance schedules will be pronounced.

(N) Inspection and repair routine has been revised to the following basis of seven-day operation:

High-Pressure Turbines—First internal inspection after 8,000 to 12,000 hours operation; subsequent internal inspections after 12,000 to 18,000 hours operation, depending upon conditions revealed at first inspection after installation. External inspection checking auxiliaries, condensers, etc., once every three months concurrent with corresponding high-pressure boiler inspection.

High-Pressure Boilers — Internal inspection after three months continuous operation. Forces are maintained at each station for routine maintenance. One crew of especially trained personnel is organized for major inspection or repair at any one station. Welding and metal spraying are used extensively for repair or rehabilitation of equipment. Special emphasis is placed on continuous use of plant testing equipment, station laboratory and special investigations looking toward detection of incipient failures. Duplicate parts, considered essential to safeguarding of continuous operation, have been provided.

(P) So far we have been able to carry on our regular maintenance program; we have sufficient reserves for a reasonable period ahead.

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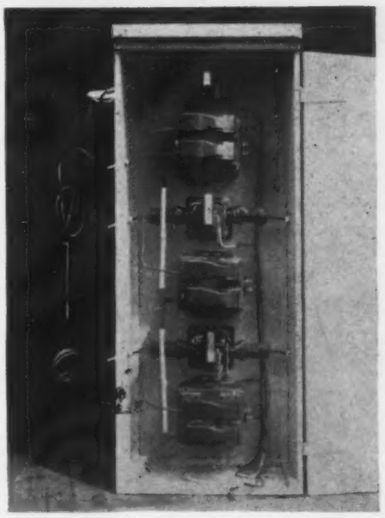
Wood Replaces Steel in Metering Housings



Wood boxes inclosing metering equipment, replacing the steel housings which had become practically standard, are coming into wider use. This picture shows an assembly of current and potential transformers housed in a wood box and ready for installation on a primary industrial service. The boxes are made of ¾-in. seven-ply plywood of pieces cut to size and shape by the local supplier.

Utility Defense Corps Prepares for War Threats*

Volunteer auxiliary defense corps of 1,200 has been organized, trained, motorized by Chicago utility to supplement local authorities in emergencies affecting company property and personnel

TO THE utility wartime plant protection against air raids and sabotage presents a problem different from that of any other industry. The geographically widespread nature of its system demands mobility in a plant protection organization, while the hazards of high-tension operation require some familiarity with electrical equipment. These factors virtually demand some type of trained employee auxiliary force to assist local police and fire authorities during air raids or other catastrophes affecting company property.

FIRST AID squad of defense corps unloads "stretcher case" at field dressing station during practice session. Corps has eight ambulances, four with two-way radio; four dressing stations. Ambulances, converted from delivery trucks, accommodate four stretchers

TWO-WAY F-M radio installation in defense corps ambulance. Map has location of all Chicago hospitals

Such a trained and mobile auxiliary defense corps of about 1,200 men has been built up in Chicago by the Commonwealth Edison Company largely from members of the Commonwealth Edison Post, American Legion. Trained in cooperation with Chicago fire and police departments, it is truly an auxiliary arm of the municipal authorities specializing, as it were, in incidents concerning utility property.

Zone System

For plant protection purposes Chicago has been divided into four zones by lines running from east to west. To each zone are assigned two battalions of the auxiliary defense corps, each consisting of three platoons; one each of firemen, police and first-aid men. A police platoon consists of 72 men, fire platoon 56 men and first-aid 26 men. Thus each zone has about 300 officers and men assigned to it.

The company's plant protection organization includes a large force of full-time uniformed special police engaged in anti-sabotage patrol and watch service. This force is provided with two-way F-M radio patrol cars, which makes it possible for police guards to reach almost any section of the city in a matter of minutes. Some of the cars are provided with

*Based on a paper presented by John Weber, Commonwealth Edison Company, before Illinois Chapter International Associaton of Electrical Inspectors.

radios tuned to the police frequency. By direct wire to police headquarters the company protection authorities thus can also dispatch guards simultaneously with police cars. Calls sent out over the company radio are monitored by the state police, permitting incidents outside the city to be met by state police and the sheriff.

While the company's uniformed special police are a part of the plant protection organization, it should be particularly noted that they are *not* part of the volunteer defense corps. The auxiliary corps is a volunteer organization which is called up to supplement local authorities only in case of air raids or major catastrophes involving the company.

Mobile Equipment

The auxiliary corps is motorized and equipped for mobility. Two ambulances, rebuilt from company delivery trucks, are garaged in each of the four city zones. One ambulance in each zone is provided with two-way radio equipment, the other with a field dressing station manned with company physicians and nurses. Ambulances can carry four stretcher cases and several walking injured. Four other ex-delivery trucks, garaged one to a zone, are fitted out as mobile kitchens. Six auxiliary fire pump trucks have also been assigned to the contingent.

Major task in the organizing of the auxiliary defense corps was to give the men the necessary training for their jobs. Training of auxiliary firemen was supervised by the superintendent of the company's safety division, using a training course for industrial fire brigades prepared by Chief Just of the University of Maryland, College of Engineering, as a basis.

Training schedule consisted of twelve meetings of two hours each. First five meetings were devoted to text material covered in the training manual. The remaining seven meetings were held at the Drill School of the Chicago Fire Department.

Auxiliary patrolmen were selected from volunteers with consideration for physical ability and mental qualifications. In training, about 35 hours were devoted to classroom work, which consisted of lectures, blackboard demonstrations as well as practical demonstrations. A grade of 75 percent or better was required for certification. The course in radio consisted of a study of laws, rules and regulations of the FCC in order to obtain a third-class radiophone operator's license.

Qualified "classroom" patrolmen were given intensive training in the handling of firearms, including triangulation, sighting, trigger squeeze, proper stance and grip. In addition to target shooting, a course of practical shooting was taught, using the silhouette target.

The first aid training of corpsmen was supervised by the supervisor of safety and training of the construction department. Each man selected was trained or retrained in the advanced Red Cross course, which requires 30 hours of classroom work. They are also instructed in war gases, rescue work and uses of corps first-aid equipment.

Instruction in war gases covered their identification, precautions to be taken and treatments to be given in the field. OCD plans call for gas decontamination stations in this area. Should gas be used company injured would clear through these stations before entering the hospitals.

In cases of sabotage or bombing of a company plant the first-aid group will take over the life saving. They will search for, rescue, treat and transport injured employees, thereby releasing operating and construction personnel for restoring service. Work unit is a four-man squad under a squad leader. Each man is equipped with a flashlight and first-aid belt.

MOBILE field kitchens—four in number—sustain defense corps in the field

FULL-TIME special police on constant anti-sabotage and watch service use two-way F-M radio patrol car

Metering Methods to Save Manpower, Materials

Conservation and economy in operation attainable by bold, but well-conceived, modification of long-established practices in utility meter departments

A. L. CARVILL, Electrical Engineer, Ebasco Services Inc., New York*

MEASUREMENT of electrical service provides a recognized control for the non-discriminatory sale of energy and power, also an effective means for its conservation by restraining use to that which is economical. It is important that satisfactory metering be continued.

However, the war effort requires the utmost economy in the use of manpower and materials and it would appear that an analysis of metering practices of operating utilities might bring out opportunities for substantial gains toward that objective. Such an analysis would include a review of practices developed over extended periods, and requirements of other company departments and regulatory bodies.

This review suggests certain items to aid toward such economies.

Test and Inspection Schedules

Utilize the ability of watt-hour meters to maintain accuracy for considerable periods of time. Lengthening test schedules will do much toward economizing in both manpower and transportation. Where regulatory authorities specify definite test schedules, application to them, substantiated by the necessary information and data, may provide relief. Several state commissions have recently relaxed testing requirements for the duration.

Single-Element and Small Capacity Multi-Element Watt-Hour Meters—Lengthen schedule to 96 months for all meters 12 kva. or less or where necessary discontinue periodic testing of small capacity meters for the duration. The Code for Electricity Meters, Fourth Edition, 1941 (approved by American Standards Association before the war), suggests a 72-month schedule for meters of 6 kva. and less. Request has been made of the American Standards Association to lengthen these schedule suggestions for the duration.

Larger Multi-Element Watt-Hour Meters—Lengthen schedules as much as practicable; *i.e.*, 24 months to 32 months; 12 months to 16 months, etc., recognizing that certain large installations may continue to require relatively frequent tests and inspections.

Indicating Demand Meters and Registers—Graphic Demand Meters—Schedules required for satisfactory operation of indicating meters depend upon local operating conditions and type of equipment used. Economies may be obtained by lengthening test and inspection schedules to a practicable maximum of three to six years. Periodic removal of charts on graphic meters provides opportunity for necessary test and maintenance at the time charts are changed.

Testing Procedures and Methods

A review of the type of testing equipment that is available and testing methods practiced may indicate possible economies.

Automatic Shop Testing Methods—Utilization of automatic shop testing equipment such as gang test boards, photo-electric and stroboscopic methods will not only increase the number of tests per tester, but will decrease the number of skilled testers required.

Date-Due vs. Geographic Testing—Testing residential meters on the date they become due for test does not permit economical routing of work. Testing on a geographic basis—*i.e.*, testing all meters in any particular area only once during the test schedule period—may, because of changes in meter locations, cause some meters to be tested ahead of schedule and other meters to have a period between tests in excess of the schedule. Most companies use a combination of date-due and geographic testing methods, but accent on geographic testing may be justified by savings in manpower and transportation.

Removing Meters for Periodic Test—The use of employees having less skill with such transportation as may be available, for removing meters, also the greater use of automatic equipment in the shop may obtain economies in periodic testing, particularly in rural areas.

Removal and changes of meters entails work and expense which ordinarily should be avoided. When meters are changed from one location to another it often is necessary to change accounting and meter records. Savings usually result from cooperative study by accounting and collection departments and meter departments for the simplification of accounting routine necessitated by meter changes.

The over-all economy of removing meters for periodic test should be judged by weighing the practicability of changing meters plus any resulting clerical expense against cost of testing meters on the premises.

Installation Tests and Inspections—Where regulatory authorities require a test and/or inspection of meters shortly after installation, application may well be made to them for permission to discontinue this practice for small capacity meters for the duration.

Where it is the practice to make tests or verification inspections on certain large capacity meters soon after installation, economies may be obtained by having such inspections made by the meter installer rather than to send another meterman to the job for this purpose.

Meter Maintenance—When demand registers, and demand meters are found to be in need of repairs, economies may be obtained by removing them for shop service because of their complex construction. This will permit detailed repairs to be made more efficiently and will decrease the idle time of transportation equipment.

It may be found practicable, in the interest of conserving materials, to discontinue replacement of parts if reasonably satisfactory performance can be expected until the next periodic test or inspection. For example: It has been the practice in many companies to replace lower bearing jewels if microscopic examination indicates minor wear or sub-surface cracks. Lowering of rejection standards in many instances will still permit acceptable performance.

Women Testers—Some companies have found the employment of women testers for shop work to be satisfactory where metermen are not available. They can be trained for this type of work, and are

* Major content of paper presented at recent meeting of E.E.I. meter and service committee in Detroit.

particularly adaptable to the operation of automatic testing equipment.

Complaint Tests and Inspections

Tests and inspections on meters and service equipment to adjust complaints require the services of skilled metermen with transportation facilities. A review of the results may indicate where savings can be made.

High Bill Complaints—Cooperation with customer service and sales departments may assist materially in reducing the number of complaint tests required. Studies of the results of previous complaint tests will show the percentage of cases where the accuracy of the meter was not within allowable limits, or where conditions other than meter inaccuracy caused high registration. Discussions with the customer and a comparison with his previous bills may assist in decreasing the number of cases where a test is requested. Due consideration should be given to any regulatory body requirements that tests be made on customer request.

Low Bill Inspections—It has been the practice in some companies to check service and meter installations where the meter registration appears abnormally low. These practices might now be reviewed to determine if as many such checks are warranted.

System Metering

Economies are obtained in some companies by having the meter department periodically inspect, test and maintain watthour and demand meters and other instruments used in generating and substations. Studies of present testing and maintenance methods may indicate that lengthening test schedules will permit savings in manpower and transportation. Conference with engineering and operating departments may show that the accuracy of operating records and operating procedures will still be adequate under such increased test and maintenance schedules.

Test and maintenance of equipment used for measuring interchange between utilities is also a function frequently performed by meter departments. With this type of installation, particularly where large blocks of power are measured, relatively frequent test and maintenance inspections may be required. Studies of meter operating results and contract provisions may indicate the practicability of lengthening present schedules.

Utilization of Metering Equipment

The priority, conservation and limitation orders issued by the War Production Board will limit the amount of new metering equipment and maintenance parts obtainable. A definite need is therefore indicated for resourcefulness in the use of available equipment.

Stock Control—Periodic reports showing detailed data on stocks in the various division or district locations will aid in obtaining the most effective use of equipment.

Pooling Spare Metering Equipment—Mutual advantage can be taken of the diversity in needs for metering equipment by pooling information on available spare equipment, by several neighboring utilities.

Metering Equipment Specifications—A compromise with previous specifications on details of meters covering such items as socket or A-type base, lower bearings of ball or pivot type, will be desirable in the interest of utilizing existing stocks, surplus stocks of other utilities, or in obtaining new meters from manufacturers.

Meter Rebuilding—Rebuilding of metering equipment to make it more useful, such as changing from A-type base to socket base, has been a practice followed by many companies under normal conditions. Restrictions on the availability of materials, particularly socket bases, will necessitate the postponement of such programs for the duration. However, limited rebuilding of meters to increase their capacity or to rearrange their coils for measurement of different types of circuits will be of value. The use of properly reclaimed parts, for rebuilding or repairing meters, will aid in the conservation of materials.

Meter Replacement—Replacement of meters in service because of obsolesence in electrical characteristics, or because they are not best suited for modern installation practices, while prevalent under normal conditions, has been discontinued for some time by most companies. Efforts toward utilizing meters presently in service to the practicable limit assist in conserving both labor and material.

Demand Meter Application—The installation of graphic versus indicating demand meters depends upon the billing information need, contract requirements, customers' desires, etc. The original cost and the reading and maintenance costs for indicating demand meters is less than for graphic demand meters and choice calls for cooperation of sales and rate departments. There may be locations where graphic demand meters can be replaced by indicating demand meters and savings effected. When graphic demand meters are required savings may be made by using 16 or 32 day charts wherever practicable.

Record of Sub-Standard Meter Installations—The recording of information of sub-standard meter installations on the meter history card or on other records, will be of assistance in correcting these conditions after the emergency.

Meter Removals, Disconnections

Practices developed as the result of accounting and collection requirements for the removal or disconnection of meters upon vacancy, affect the number of operations performed by meter departments.

Meter Removals—Studies of manpower and transportation required for removing residential meters and disconnecting service drops because of vacancy may show that economies can be effected by leaving the equipment in place for future occupancy. Such removals might be postponed for a period of six to twelve months, except where it is known that the premises will be permanently vacant or where it is necessary to obtain meters for use on other installations. Corresponding savings would be made in the number of required shop tests on removed meters.

Meter Disconnections—Where residential meters are not removed for vacancy, savings may be possible by not physically disconnecting the installation but by leaving service available and the meter connected to register any energy consumed. Several companies have followed this plan with considerable success by having the new customer notify the company when service is desired and by using the previous "read-off" index to start the new billing. With this procedure only one visit to the premises is required because of change in occupancy.

Meter Records—Simplification of meter record procedures conserves time and paper work. A review of the entire meter record and clerical procedures may indicate practicable savings in unnecessary forms, records, reports and clerical operations. Conference with other departments may result in simplification of meter records that are now required for other than meter operating functions. Such studies could well be coordinated with the requirements of regulatory authorities.

Routing of Work Orders—An investigation of the routing of wiring inspection, installation, reconnection, removal, complaint test and other work orders may result in savings in both manpower and transportation, through the grouping of orders to be executed as far as practicable by one employee and avoiding multiplicity of visits to any one area.

Transportation Methods

Need for conserving tires, gasoline and automotive equipment have dictated changes in the use of transportation. Many meter operations may be carried out by utilizing public transportation facilities. Bicycles may be used by metermen in urban areas, where the transportation of heavy tools and equipment is not required.

Organization—The loss of skilled employees and changes in operating practices as a result of the war indicate the desirability of making studies of personnel for the purpose of rearranging the organization to promote the most economy and efficiency.

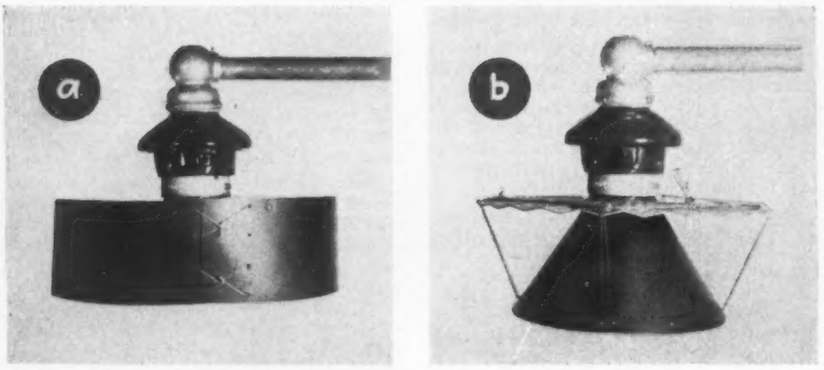
Safety Practices—Observance of proper safety practices is of considerable importance as an aid in decreasing lost-time accidents and promoting best use of available manpower.

Trouble Calls

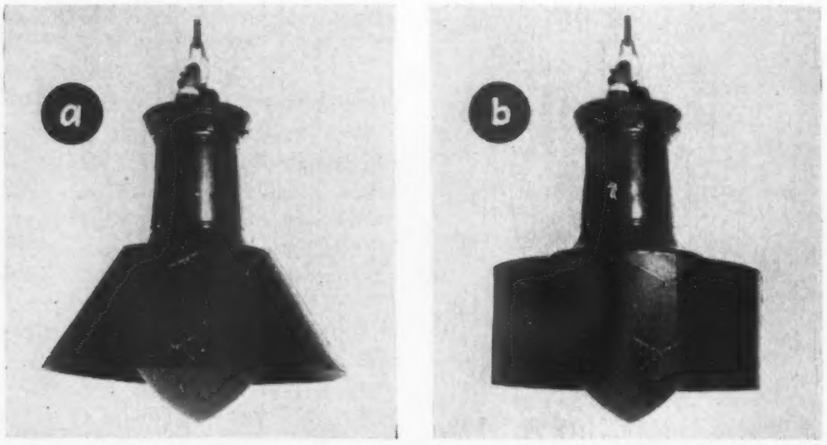
Employees of meter departments are utilized by some companies for certain types of service outage complaints such as those requiring the replacement of blown fuses on customers' premises. Conference with sales and other departments will assist in developing educational programs to promote the renewal of fuses by the customer, for the purpose of decreasing the outage time to customers and the manpower and transportation requirements of the utility.

DIMOUT CONTROL DEVICES

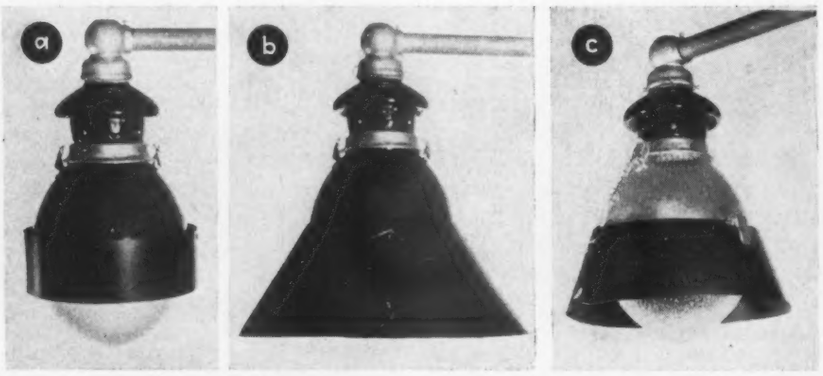
DIMOUT control devices of water-resistant fiber are utilized in street and highway lighting by operating companies of the New England Power System in areas adjacent to the coast. Elimination of direct rays toward sea and prevention of sky-glow while maintaining highway safety and public morale are major objectives. New England Power System engineers directed these designs (which total more than 30 combinations, including modifications not shown) with the



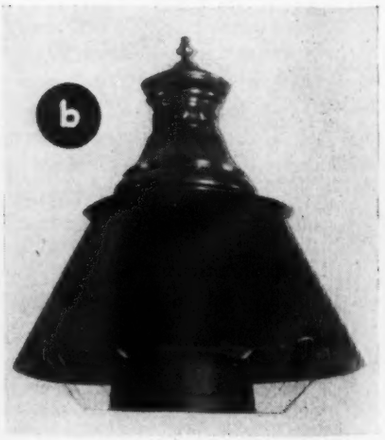
TWENTY-INCH radial wave reflector
(a) General use to avoid sky-glow. Skirt is about 7 in. high, has about 5 in. effective shading band. Two rows of fiber buttons above and below edge of shade hold skirt on shade and prevent tipping in heavy wind. Wire lacing tightened in place by lineman. (b) To be used where unit is directly visible from the sea. Neck of cone fits around lamp socket. Tied with marlin or equivalent at four points.



FORM 6 luminaire, Nos. 116 and 166 globes, for general use to avoid skyglow
(a) Without reflector. Cone supported on lamp housing by taper. Fibre buttons below housing prevent uplift. (c) With reflector. Effective skirt height is 7 inches.



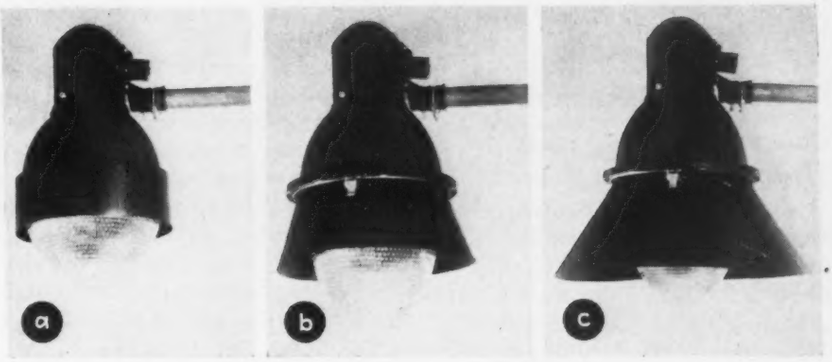
FORM 79 luminaire—(a), (b) with spun-on reflector, (c) with hinged globe
(a) General use to avoid skyglow. (b) To be used where light is directly visible from sea. (c) General use to avoid sky-glow. Slots for hinge and for latch are cut in skirt. Lamp replaced by opening unit at top.



FORM 10 arc luminaire with 37 globe
Skirt is riveted to fiber ring which rests on top of globe. Tied with marlin. (a) To avoid sky-glow and (b) to be used where light is visible from the sea.

FOR STREET LIGHTING

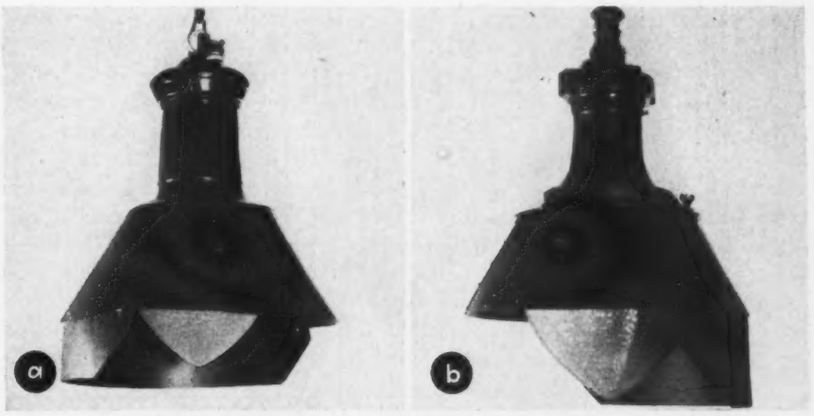
cooperation of Commonwealth Supplies Company, Amesbury, Mass., which fabricated the product. About 12,000 street lights energized by twelve system companies have been equipped under general supervision of a War Lighting Control Committee consisting of L. A. Fiorani, merchandising manager, chairman; E. W. Dillard, electrical engineer; C. D. Lawrence, power sales manager; A. S. Walker, operating engineer; J. W. Young, executive assistant.



REFLECTOLUX-REFRACTOLUX (a) with clamping ring and short globe and (b) and (c) with hinged globe

(a) General use to avoid sky-glow. Single narrow notch in skirt fits over ends of clamping ring. (b) To avoid sky-glow. Cone wired to hinge and to latch tongue. (c) To be used where light is directly visible from sea.

ROUND GLOBES, 12 and 14 in. diameter. Closed cone to avoid sky-glow



FOR ALL shades and all globes

Skirt extensions where greater depths are required to avoid sea visibility or building reflection—(a) with 166 and (b) with 162 globe.

TRUNK LINE HIGHWAY—Dimout control devices installed on units in foreground; unshielded units farther back

PRIORITIES PROBLEMS

Contracts Under L-94

Case No. 29

There is no hard and fast set of rules as to who pays the cost of transmission lines and facilities erected in compliance with Paragraph B-3 of Order L-94. The order itself directs only that utilities work out voluntary arrangements with non-utility power sources wherever possible, reporting to WPB those cases where this cannot be done.

Under the order, the utility is directed to take the initiative, and in many connections which have been worked out to date the utility, as the potential chief beneficiary of the additional energy supply, has undertaken the job of constructing and maintaining the war emergency facilities. Where the arrangement contemplates interchange, however, costs and responsibilities are frequently shared.

Here is a summary of an interchange contract between a utility and a municipality which has been reported to WPB's Power Division. The interconnection involved construction of 5 miles of high-capacity line, relocation of a substation nearer the center of the municipal load and installation of additional substation equipment, primarily to give the utility access to approximately 2,000 kw. of presently surplus power in the municipal system.

The company assumed the job of building and financing the construction work and of maintaining the facilities. The city agreed to furnish the new substation site and to pay one-half of the carrying charges on the emergency facilities, calculated on a basis of 4 percent interest, 3 percent depreciation and 1 percent taxes. Energy is to flow either way over the line upon request, but delivery need be made only out of surplus as available, if any. Energy is supplied at a flat rate either way, with settlements provided monthly both on the net interchange and upon the municipality's share of the fixed charges.

The contract carries a provision recognizing that operation of the connection may be made subject to direction and control of WPB and agreeing to mutual acceptance of any such orders which may conflict with contract provisions.

The company and the municipality each assumes liability for losses or damages resulting from its own sole negligence and liability for injuries to its own employees or losses to its own property in event of concurrent or undetermined negligence. Injuries to non-employees or damage to private property are a 50/50 liability if the result of concurrent or undetermined negligence, as is damage to the interconnection property.

Extensions to Old Structures

Case No. 30

Until the issuance of the latest revision of Order P-46 on October 10, 1942, utilities had blanket authority to make extensions under 250 feet to provide service to old buildings which were wired or piped prior to July 1, 1942.

This authorization was eliminated from the new order and utilities now must make individual application to WPB for authority to provide service in such cases. As a general rule, however, such applications are being rejected on the ground that the scarcity of metals is now so serious that it is felt that buildings which have stood for any length of time without services should not get service now.

An example involves an old house in a small town which was wired for electric service last spring but for which an extension had not been sought because the place until recently was vacant. WPB turned down an application for service now on the ground that the house is equipped with gas illumination, which had been used for a number of years and could still be used.

Another frequent type of case is that of a house which has been built piecemeal, which was wired prior to July 1 but which has only recently been completed for occupancy. These applications are considered on their individual circumstances and sometimes an extension is authorized. Application for authorization is made by P-46 letter if the materials are in stock, on a PD-1A form if material must be purchased with priority ratings.

Extensions to Buildings

Case No. 31

Priorities application for extensions of utility services for new building projects, other than houses, are now filed, analyzed and approved right along with the contractor's project application by a parallel procedure similar to that for war housing (see Case No. 3, September 5, page 57).

This should mean the end of incidents such as have been duplicated all over the country—where new buildings are erected without utility extensions having been approved and then must stand idle while the utility gets permission to make the connection, or, worse, may become useless if the utility is refused authority to proceed.

The changed WPB procedure—in Order L-41—requires that a contractor obtain from utilities an application to build the necessary service extensions and attach it to his own project application for submission to WPB's Construction Division.

How should the utility application

Re INVENTORY is now specifically defined in Order P-46 to include "all new or salvaged material in the producer's (utility's) possession, unless physically incorporated in plant, without regard to its accounting classification"—except materials specifically exempted. Exemptions in the definition cover material which is segregated for use in additions and expansions to war plants as authorized in paragraph E-2 of the order or material segregated for use on a construction project having a WPB authorization resulting from a PD-200 form application. Everything else must be counted against the P-46 quotas.

be prepared? Do not use the PD-545 form, which is intended exclusively for housing. Instead, make application in letter form, supplying data on the job number, relationship to military need, estimated cost of the extension, a list of materials segregating those to come from stocks not to be replaced and those which are to be purchased or replaced in inventory. Give also a description of the proposed construction, including a map, and state whether service could be provided in any other way with use of less critical materials (Administrative Letter No. 7 from WPB's power division).

The utility application is given to the contractor and will be rated and approved at the same time as the latter's application—with WPB thus having before it the entire picture of what a given project will require in critical materials upon which to base a decision.

Authorization will come to the utility directly from WPB.

Anticipating Short Stocks

Case No. 32

Because of the requirement in the new Order P-46 that utilities actually sell surplus stocks of materials in any class before they can accept deliveries of other materials in that class (see Case No. 25, October 31, page 68), many utilities are finding themselves with inadequate amounts of certain items but with a surplus of other stores in the same class which prevent them from getting necessary supplies of short materials.

Partial remedy for this situation lies in Paragraph F-4(iv) of the order, which permits purchases of short items up to 5 percent of the total withdrawals in 1940 of materials in the same class. In other words, if a utility used $100,000 worth of all kinds of wire and cable in 1940, this provision permits purchases of $5,000 worth of wire in sizes not on hand in any quarter, regardless of inventory.

Where requirements for short items of material exceed this percentage, the only remedy is to write WPB's power division, asking authorization to exceed the limits. Some utilities minimize the paper work of this procedure by analyzing their short item needs for an entire quarter at one time and asking a single authorization to exceed the limits. This avoids both the trouble and delay of making separate application for each purchase as the need arises.

To get this approval from WPB, utility applications must show the dollar value of present inventory of short item materials, the dollar value of such materials used in repair and maintenance in the preceding quarter, the estimated dollar value required for the quarter for which the exception is sought, and a showing of the amount by which this extra-limit need exceeds the 5 percent relief clause.

WPB HAS GIVEN material salvaged from plant a "bonus" status to encourage the practice. Paragraph F-4(vii) of Order P-46 permits utilities to use salvaged material, or its equivalent dollar value in new material, without regard to the restrictions on withdrawals of material from inventory. Reuse of such as an extension is not permitted, however.

Up-Rating Orders

Case No. 33

New and higher priority ratings are available to utilities in the latest revision of Order P-46. Up to 30 percent of permitted purchases may now be assigned an AA-2X rating and the rest an AA-5 rating; this compares with previous A-1-c and A-5 ratings of the old P-46.

Because of the continual "Inflationary trend" in priority ratings, especially for really scarce materials, utilities with orders carrying the old P-46 ratings frequently find that these old ratings are not adequate to get delivery at the time the materials are needed.

In such cases a number of utilities have filed applications with WPB for permission to up-rate their orders with suppliers in order to speed delivery.

An example is the utility which had ordered, some months ago, miscellaneous electrical equipment for its generating station only to discover, now that delivery was due, that delivery could no longer be made on an A-5 rating. The utility appealed to WPB's power division on a PD-1A for the double-A rating the supplier said was needed.

This isn't necessary where the new P-46 ratings will do the job. The power division returned the application with instructions to the utility to file with the supplier a statement on Form PD-4Y, obtainable from local WPB offices, that under the new P-46 the order is now up-rated to AA-5 or AA-2X, whichever is needed and available to the company. Receipt of such a form is all the supplier needs to put the order ahead of others with lower ratings on his books.

Contest Set to Reduce Steam Plant Accidents

Fewer accidents in steam plants all over the country will count heavily in furtherance of the war effort. Recognizing this, the Northwestern Electric Company of Portland, Ore., has started a contest for eliminating accidents at Lincoln station. The opening date was August 31 and it runs through to November 30, with a big dinner at one of the best hotels for the winning team. There are six teams, captained by the chief engineer, four shift engineers and the foreman of the station. Holding strictly to Post Office rules, in case of a tie "duplicate prizes will be awarded." The contest was kicked off with an announcement bulletin.

The winner of the contest will be the team having the lowest accident frequency rate at the end of the period, meaning the lost-time accidents per 1,000,000 hours worked. Only lost-time accidents are counted. If a man is injured and does not return to work at the start of his next regular shift the accident is counted.

Standings of teams are posted each week on the bulletin board showing frequency rate to date of each team. When the rate of more than one team is zero, the team having worked the greatest number of man-hours will be the week's leading team.

Editorials

S. B. WILLIAMS, *Editor*

War Power Agencies Must Cooperate

THE UTILITY INDUSTRY is considerably perturbed over the President's suggestion of a few weeks ago that power for war plants be purchased at the lowest possible cost. This was followed a month later by another Presidential letter to FPC outlining how the suggestion was to be made effective.

To complicate matters further, the newly created Eberstadt Facility Clearance Board has authority over all construction projects to cost in excess of $100,000. The active administrators of this authority are now reviewing project by project the power program, lines as well as prime movers.

A careful study of both letters of the President disclose, first, that power contracts for all future war loads must have the approval of FPC and that all contracts so far shall be subject to FPC review and, if deemed necessary, renegotiation.

The second point is that FPC is given the authority to make available such facilities as will effectuate the program. Now, while the commission later is directed to establish procedure after consultation with procurement agencies and WPB, it is obvious that FPC has the whip hand over WPB if it wishes to exercise it. It is equally obvious that the new Eberstadt board is in a position further to sterilize the WPB power branch.

With respect to the cost of power, it has never been suggested that WPB jurisidiction be extended thereto. If that be the authority of any one, it should be that agency of the government most familiar with rates and costs, FPC. And since the President specifically stated that there will be no discrimination in favor of public or private power, FPC in comparing charges for power need not feel that it is charged with any responsibility to protect and favor government power projects. It would therefore be reasonable to expect the commission to balance net charges; *i.e.*, less taxes; if not all, at least federal taxes.

When it comes to the operating end, to insure an adequate supply of power for war production there can be no effective administration if several overlapping agencies work at cross-purposes. That was the very reason for the famous WPB-FPC treaty.

The people showed on November 2 that they were sick and tired of actions that impede the war program. The people want team work in Washington. They don't want any more czars of this or that, but, as sure as can be, they will get a power overlord if those with jurisdiction over war power supply do not find a practical way to cooperate effectively.

If these agencies cannot cooperate, then get men who can. There is much less impediment to the war program in changing men than in changing policy.

Today's Preparation for Winter Storms

WE ARE NEARING the season when storms often do widespread damage to power distribution and transmission systems. In the past, even when men and materials were not available, the power companies have done superhuman jobs of repairing their broken wires, uprooted poles and overturned towers when ice, wind and water went on the rampage. Now, the times, more than ever, demand that they be in position to do every bit as good a job to keep industry going, hospitals and institutions served and transportation rolling.

To do this, however, they must have supplies, manpower and truck equipment adequate to the emergencies, which means a considerable margin of such facilities beyond the normal requirements for routine day-to-day maintenance and upkeep. To some extent the decline in construction activities contributes to the necessary reserve equipment and supplies. Moreover, in many instances linemen who are being transferred to other activities are available for call back to line repair duty in an emergency.

The crucial things at the moment appear to be tires and gasoline, and it is to be hoped that the rationing of these things will be carried out in such a way as not to hinder the power companies from being fully ready to restore service after wide damage. They are fully aware of the shortages which all must share and they deserve a sympathetic hearing when they recite what it takes to make extensive repairs after a state-wide storm as compared with what they can get along with in handling the routine job. Otherwise, the good work that has been done in squeezing more power out of plants, transformers, cables, conductors will be obscured as long as the lines cannot be restored to their function of delivery.

A Substitute for "Substitute"

NEW TERMINOLOGY is needed properly to characterize what happens when the vanishing of one material leads to the adoption of another, particularly when the new promises to supplant the old more or less permanently. "Substitute" does not do it with finesse, because it carries

the connotation that something is being concealed from the buyer—the warning not to accept a substitute has scotched that term for use where the replacement is honest and progressive—while "alternative" hardly expresses more than a second choice status, with the implication that properties are slightly inferior.

"Synthetic" is gaining in stature, but there probably is still too much reluctance to admit that science can improve on nature. "Artificial" conveys the impression that science has not improved on nature-produced materials, but is merely trying to escape a dilemma. Certainly *ersatz* is out, first, because it comes from a dishonored tongue and, second, because it signifies something comparable to coffee made from mahogany sawdust.

Nor is "equivalent" good enough to typify what ingenuity devises to do a better-than-equal job.

A word is needed, therefore, to express what is happening in many a line. Who will coin the term that unmistakably says that what has been devised to dodge a shortage is as good and maybe better, or even more comprehensive in favorable characteristics and nearer the ideal than any predecessor constituent? The right word will exemplify and extol American ingenuity, which is already showing signs of emerging from the makeshift-substitute stage and entering a new era of creation of products that will surpass what habit and complacency rendered the vogue until necessity made invention a mother anew.

Kaiserism—1942 Style

WHAT has the electric power industry to learn from such a personality as Henry J. Kaiser, builder extraordinary of dams, ships, planes and plants?

In a newspaper interview at the recent meeting of the Associated Industries of Massachusetts, in Boston, Mr. Kaiser stated that there has been no bottleneck in power in the enterprises under his direction and said that electric power is fundamental to success in shipbuilding at today's tempo, whether the application be welding, machinery driving or lighting. It goes without saying that no single organization could build around 300 ships in one year and cut the keel-to-launching time from months to days without backing up intensively trained labor, massed raw materials and revolutionary processes of layout and construction with ample electric service at every stage of the operation.

It is certain that the Kaiser attitude toward the job, however difficult or vast, is one of the greatest assets of the man. Obstacles exist to be overcome now. Unorthodox methods rank with time-honored procedures—in fact, challenge the precedents of industrial generations. Leadership of this sort spurs every last man and woman concerned to beat the production record. Is this kind of thing foreign to the electrical industry? We think not. Electrical progress in the past reflects this policy, characterized by open-mindedness, unwillingness to venerate the sacred cows of hoary precedent, determination to back new ideas in design, production and marketing, capacity to foresee public needs. Will it continue in the future? Will it show the same kind of fearless approach to post-war problems? Of engineers there can be no doubt, but what of management?

Electrical industry leadership must be in phase with the 1942 brand of Kaiserism in America and must utilize more of the same broad-gauged fearless philosophy in the critical months before us all.

Exit Senator Norris

THE MAN who probably did more than anyone else to promote public ownership of electric utilities on a national scale went down to defeat on November 2. Senator George W. Norris, after serving forty years in Congress, ten in the House and thirty in the Senate, lost to a Republican campaigning on an anti-New Deal platform.

Senator Norris has carried the title of the "great reformer" for many years. Regardless of whether one sided with him or not, there could be no question of the integrity of the man in his opinion. In late years, as he grew old, many men have tried to wear his mantle of champion of public ownership. They have been of an entirely different stripe. They sponsored the cause, not because of a burning belief but because it would advance them personally—or so they thought.

Rankin, who first aspired to the succession, was found to be but a voice that ofttimes became monotonous. Ellis was repudiated in his own home state a few months ago when he aspired to follow Norris in the public power bloc leadership in the Senate. He now has accepted a job as a paid Washington propagandist for public power through REA cooperatives.

Let it not be believed, however, that when the old leader is gone the public power contingent will be rudderless and therefore ineffective. The only difference is that the leadership will have shifted from Congress to a bureaucrat. Where formerly it was out in the open, with bureaucrats at the beck and call of Norris, now it is likely to be the other way.

What they will lack will be the sincerity of a man who had nothing personally to gain from his reforms. Where before it was not possible to question the integrity of motives, now one will wonder who has an axe to grind.

Like most great reformers, Senator Norris never hesitated to use whatever means there was at hand, feeling that it was not the tool that mattered, only the ideal. Whoever succeeds him in this work, therefore, can be no more powerful antagonist, no more ruthless.

And so, though we voice no regrets as he leaves the place he has occupied for so many years, we cannot refrain from recognizing the man's singleness of purpose and his persistence in pursuit of a concept. His name will live in history as one of the forces in the trend of electric utility development.

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

WPB Power Branch in Trouble

JURISDICTION of WPB's power branch over the wartime power program is facing disintegration.

Siphoning of authority away from the branch is either an actuality or immediately threatens from both inside and outside the War Production Board, in at least three major spheres of operation. Now the least aspect of the situation is the fact that some of the agencies which are moving into the power field justify their steps on the ground of the branch's own apparent failure to formulate and execute effectively its own program.

The three principal areas of jurisdiction immediately at issue are power supply allocation, power plant and facilities expansion and utility inventories. Determination of maintenance policies may develop into an issue when the Controlled Materials Plan for allocating copper, steel and aluminum goes into effect next year.

Power Allocation

To what extent the Federal Power Commission intends to assert itself over power allocation with its recent "instructions" from President Roosevelt to make sure that the government gets wartime energy from the cheapest source remains to be seen. There is ample evidence that FPC considers it has been ignored by the Power Branch and that it intends not to be ignored any longer.

FPC, at this time, characterizes the President's letter primarily as a "confirmation" of jurisdiction it always has had over rates, implemented now with clear-cut authority to review the terms and conditions of all government power purchases, where before it participated only when the procurement agency consented.

Behind this surface aspect, however, is the fact that the President's action places the dollar cost of power and allocation of power on a parity administratively, with FPC in charge of one subject and the power branch the other. It is no accident that this was done, nor that in doing it the President broadened the scope of the potential use of the "common carrier" principle for obtaining the cheapest power far beyond its original concept.

Common Carrier

The original letter of September 26 to procurement agencies spoke of the unfairness in letting utilities without power supply of their own buy energy wholesale from "neighboring public power agencies" for resale. It is generally conceded that the sponsor of that letter was intent upon insuring a means whereby Bonneville Power Administration, and perhaps other government projects, would not be cut off from new customers simply because materials shortages prevented building lines. In his October 22 instructions to FPC, however, the President deliberately did not limit the "common carrier" principle to cases involving wholesale sales of government power for resale to war plants; instead he directed use of the procedure wherever it would save money.

This change is traceable to FPC's snatching at a "windfall" and, as a result, what was proposed as a helping hand to bridge the materials shortage gap for government projects now represents a full-blown bid for participation in the supply allocation picture. What effect will this have on continuation of the regional pooling efforts of WPB, which already have "created" 1,250,000 more kilowatts from existing equipment?

In the area of jurisdiction over power facilities, the Power Branch is losing control to the new element within WPB which has been absorbed from the military services. The recently set up Facilities Clearance Committee, headed by Vice-Chairman Eberstadt, with two Army officers as administrators, has taken over from the branch the say-so on all utility construction costing $100,000 or more, along with jurisdiction over all facilities construction.

Interwoven in this jurisdiction dispute, also, are the long-smoldering differences between the power branch and the Army's power men. Some of the government power projects included in the branch's program were opposed by the Army last summer and are being weeded out now. Secretary Ickes, who had been sharpshooting at the branch's program in an effort to expand his portion, is now in near-revolt which may lead him to the White House with charges that the government's power program is being wrecked. Such a move could result in giving power "independent" status in the war agency hierarchy.

Inventories

The power branch's jurisdiction problem regarding inventories has been discussed previously on this page (ELECTRICAL WORLD, October 31, 1942, page 80). The jurisdictional problem in maintenance as yet is only on the horizon, but the potential precedents are being laid amid the current maneuvering over construction.

If the "topside" allocating agency for construction is going to handle individual projects, what happens when maintenance materials are placed under the accounting procedure of the Controlled Materials Plan? Will the office of Civilian Supply, which will be the "claimant agency" for materials allocations to satisfy all non-direct war needs, endeavor to determine maintenance policies, leaving the power branch only the administrative job of executing whatever plans are passed down along with an allotment of materials?

This isn't the first time that "raids" have been attempted on the power branch's authority. Always before, the raids were beaten back because the branch had a better program and got it into operation quicker.

NEWS OF THE WEEK

See Court Test on OPA Rate Intervention

District of Columbia Public Utilities Commission rejects price agency's plea to intervene "without restriction" in Washington Gas Light case — Restrict testimony to inflationary effect

In its first major test of the new controls over utility rates under the anti-inflation law, OPA has formally claimed the right to demand and obtain a full hearing on any point in rate-making regulation it sees fit to raise. OPA's contention has been rejected by the District of Columbia Public Utilities Commission, before whom the right of intervention "without equivocation and without restriction" was made in the Washington Gas Light Co. case, and the case appears headed for the courts.

Insist on No Strings

"The petition we must insist upon," the brief of H. R. Booth, OPA's utilities counsel, says, "is that if we, as the agent designated by the director of economic stabilization, are to comply with the obligations imposed upon us in utility rate proceedings, there must be no strings or restrictions attached to our ability to make an adequate showing that the rates of the Washington Gas Light Co. should be no higher than charged by the company to its customers on September 15. We must be given the right to examine every issue which the courts have held enters into the making of fair and reasonable rates regardless of the terms of sliding-scale arrangements or previous conclusions by the commission that a rate "increase is justified."

Mr. Booth specified that the issues upon which he wanted to be heard in this case include the determination of a proper rate base: "On that point an inquiry should be made and promptly as to why the rate base should not be predicated upon the original cost of the company property; reasonableness of operating expenses, including depreciation; determination of what taxes in wartime can be charged to operating expense, and determination of a fair rate of return for wartime conditions."

Denying the OPA petition, the commission restricted the agency's appearance to testimony bearing upon the question of the inflationary effect of an increase in rates. At this point OPA withdrew from the case to decide in what form to appeal to the courts.

DISTINGUISHED VISITOR — Governor Bricker of Ohio visited G.E.'s Nela Park recently and showed a lot of interest in the Wartime Lighting Service Record there. The company's program to break lighting bottlenecks in war plants was of special interest to the Governor because of the high number of Ohio persons engaged in war production. Above, left to right—J. E. Kewley, G.E. vice-president and general manager of the lamp department; Governor Bricker and M. L. Sloan, manager of the G.E. lamp department

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Olds Urges TVA for Southwest

Terming electric power "the key to our industrial mobilization," Leland Olds, chairman of the Federal Power Commission, last week told the War Labor-Management Conference, sponsored by the University of Oklahoma, that the Southwest was admirably suited for the development of regional power resources. He urged that a post-war power plan be developed for the region along TVA lines.

Pointing out that the great power resources of the region have scarcely been tapped, Mr. Olds envisaged an ultimate development of hydro-electric resources with a capacity of more than 1,400,000 kw. and of 1,000,000 kw. of new steam plant capacity required for the program. If developed along TVA lines, the chairman prophesied, the Southwest regional program should make a vast new power supply of about 10,000,000,000 kw.-hr. a year, at a wholesale power cost approximating 5 mills a kilowatt-hour, including transmission. At site power costs will range as low as 3 mills, he said.

"The defense program, followed by the war, has brought manufacturing industry to the Southwest," Mr. Olds declared, "but the limited power supply has cramped a development which, be-

A JOB WELL DONE—At the presentation ceremonies of the Army-Navy "E" award to Combustion Engineering Co. 3,000 workers and their families hear officers of the services and company officials laud their efforts in setting new production records

cause of your strategic location, might have been much larger. Furthermore, the attempt to carry this development over into the peace which will follow victory will depend on the success with which a regional program is pushed to assure lower power costs. For, while the war brought an aluminum plant to Arkansas, which called for almost as much electrical energy as the entire state consumed for all purposes in 1940, the present cost of power supply for that plant is well above the range required for economical production."

According to Mr. Olds, the TVA and the Bonneville Power Administration program for the Columbia Basin in the Northwest have rendered out of date the old "trend" theory of deciding when a development will be economically justified. "I want to substitute the theory," he said, "that great quantities of power, if available at low enough rates, will rapidly develop their own markets which would not have otherwise been available."

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Army Electrical Men Promoted in Rank

Three of the electrical men in the Army's Resources Division, Services of Supply, have been given promotions in rank within the last two weeks. Col. John C. Damon of the Engineer Corps and Major Robert Wardle, Jr., of the Coast Artillery Corps, both members of the division's power section, have been promoted from lieutenant-colonel and captain, respectively. Lieut.-Col. Maurice R. Scharff, chief of the priorities and allocations section of the division, was promoted from major.

Loads Not Up to Estimated Demand

P.E.A. Operations Committee Reports on Northeast Conditions

Water in the power ponds of the Northeast is plentiful after a favorable season of precipitation; also loads in the territory in general have fallen behind the demands estimated for the present period and in several instances behind 1941. This conclusion is drawn from data reported by system operators from New York, New England and Maryland, as well as those whose guests they were—the systems operations committee of the Pennsylvania Electric Association—at a meeting in Harrisburg on November 4 and 5. There was considerable expression that the Weather Bureau should make available to the utilities more than the present meager releases on temperature and local forecasts; they would be better enabled than at present to prepare to handle storm emergencies and to use water that would otherwise spill. Warning of sudden overclouding would conserve fuel oil and its transportation at steeply loaded steam plants.

Women are being used for drafting and logging in certain dispatching offices and other companies are considering them for substations, but the facilities available, particularly where one woman may be assigned with several men, are the crux of the effort as reported by Arch Millar, managing director of P.E.A. As for deferment of a shift operator, it was urged by several that the 42A form be filed when he makes out his draft questionnaire, but that this be done only where the company is prepared to carry appeals to the last resort.

Expectation was expressed that intensification of blackout orders would occasion 50 percent dips or more in load and accentuate the task of subsequent pickup in the steam plants, particularly where oil is not used under the boilers. W. R. Hamilton said that the West Penn system would act on the 30-minute warning in tests to get all hydro on and relieve the jolt on steam. Interference by wardens to company truck and car movement has not been solved. Millar had arranged for the showing of the Bell of Pennsylvania Vocafilm on air raid warning, depicting the functioning of spotter, filter and plotter centers and the OCD activities.

In an actual air raid some companies will reduce line loading to zero by bringing on added capacity at load centers. Whether to shut down high-pressure units was left a moot question, although it was admitted that a spinning rotor is more vulnerable than an idle one. C. P. Corey warned against too much reliance on hydro because of likelihood of line damage, but did feel that no steam should be opened wide for load resumption when others are available to share it.

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Revenue Bureau Silent on Exemption

The Internal Revenue Bureau has made public no ruling to date on a request from the Bonneville Power Administration for a special tax exemption privilege permitting the purchase by a government agency of the Puget Sound Power & Light Co. The Bonneville request was made despite the fact that Congress. in enacting the 1942 Revenue Act, specifically rejected tax privilege provisions that would permit public bodies to acquire private utilities and operate them free of federal taxes (ELECTRICAL WORLD, October 17, page 70; October 24, page 5).

Disclosure of the aim of the Bonneville power authority came during a recent SEC hearing on a proposed recapitalization plan of the Puget Sound Power & Light Co., which is scheduled for divestment from its parent, Engineers Public Service Co., under the "death sentence" provisions of the Holding Company Act. In response to questioning by SEC counsel, C. G. Davidson, Bonneville attorney, admitted that he had been endeavoring to obtain a memorandum from the Treasury Department to provide for tax exemption on a non-profit corporation. It was also brought out at the SEC hearing that the investment banking firm of Lehman Bros. was ready to undertake the sale of bonds.

Government Revises System of Drafting Key Workers

Individual-plant "manning tables" provides for orderly withdrawal of draftable key workers and training period for those replacing them — Manpower Commission reviewing occupational bulletins

With formal release this week of a procedural outline for setting up individual-plant "manning tables," utilities and other essential war industries now have at their disposal the government's latest device for effecting an orderly withdrawal of draftable, key workers from war plants.

Hinted at and discussed informally for months (ELECTRICAL WORLD, October 17, 1942, page 68), the plan is based on the blunt proposition that "needs of the armed forces will compel the eventual induction of practically all men who can meet the age, physical and other requirements; these men must be released by industry."

The manning-table procedure is intended to provide "the basis for withdrawal of such workers at a rate that will allow others not suitable for active service to be trained to replace them."

Lists Different Skills

Fundamentally, a manning table is a list of different jobs in a given plant, with each type supported by appropriate data. It records the type of worker needed to fill a specific job, the skill, training and experience needed to fill each job, essential characteristics workers need to do jobs properly, and the length of time required to train a replacement for any given job on the list. Obviously, the table which is left after management-government conferences bring approval for any specific proposal, will be a compromise.

After obtaining permission to participate in the plan, utilities draw up manning tables on forms provided by the War Manpower Commission and submit five copies to the regional WMC director. When validated, a copy of the plan is forwarded to the state Director of Selective Service holding jurisdiction. His approval is required before the table will have any effect on any Selective Service activity.

On acceptance, the state director will assign the utility a state acceptance number which shall be listed on occupational deferment requests for all workers of military age (Form 42A). This number will give local draft boards notice that the employer's plan for worker replacement has been drawn along approved lines.

Currently, even without a state acceptance number, Form 42A is written evidence of the occupational necessity of the registrant for whom it is filed. Thus far, board actions on these requests, however, have been so spotty as to bring considerable confusion.

Both Paul V. McNutt, War Manpower Commission director, and Draft Chief Lewis B. Hershey hope for very definite changes in the present, uncoordinated methods with which local boards handle 42A requests. Both hope that voluntary use of manning tables will be so widespread as to send a flood of state acceptance numbers over local board desks. In such event they feel that appearance of such a number on a request for occupational deferment would lead to more or less automatic granting of the requested deferment. This is expected particularly of local boards which deal with employees of large industrial plants, whose individual importance to the company can be known to board members personally only in relatively few instances.

Conversely, Washington is looking toward the day when a request for occupational deferment without an acceptance number will get correspondingly short shift from the local board.

Although WMC for several months has been urging the use of manning tables on employers who sought its aid, this week's action was the first to throw the plan open to essential industries generally. Currently, it is open on a purely voluntary basis.

Meanwhile, WMC's technical committee, which took over establishment of lists of critical occupations from Selective Service, has scheduled a review of Occupational Bulletin No. 9, which classified the electric utility industry as essential and listed 86 occupations therein as critical.

Currently, the committee is finishing its general list of critical occupations. Thereafter, it will review that list and then begin reviews of the twelve occupational bulletins issued by Selective Service before WMC was organized. No decision on Bulletin No. 9 will be forthcoming for several weeks.

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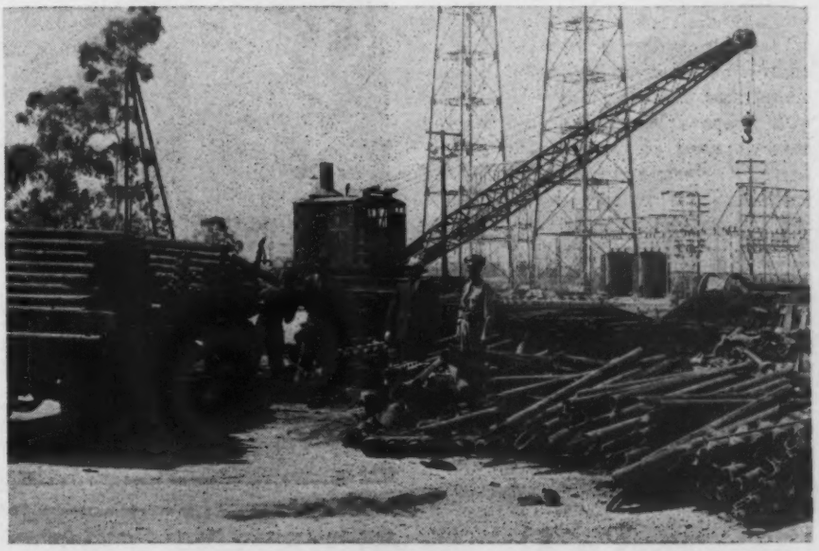
Commissions Approve Wilder Hydro Sale

Both the Federal Power Commission and the Securities and Exchange Commission put their seal of approval last week on the sale of the Wilder hydroelectric station of the Olcott Falls Co., on the Connecticut River, to the Bellows Falls Hydro-Electric Corp. for $200,000 in cash. The plant has an installed capacity of 5,220 kw. Other physical properties of the Olcott Falls Co. are included in the sale to Bellows Falls, a subsidiary of the New England Power Association.

Original application for authorization of the sale of the property was filed in August (ELECTRICAL WORLD, September 5, page 74).



MORE SCRAP—Cast-iron tubes and headers from four economizers in plant No. 1 of Southern California Edison's Long Beach station—all obsolete equipment—is loaded for the scrap pile. A. B. Myers, head of the company's salvage department, and M. T. Ingle, guard inspect the operation. Some 400 tons were salvaged from this source alone

Utility Seizure in Porto Rico Protested

Federal officials charged with attempt to socialize power industry on pretext of national defense — Lanham act twisted, counsel asserts in court hearing

Gov. Rexford G. Tugwell of Porto Rico, erstwhile New Deal brain truster, and Secretary Harold L. Ickes of the U. S. Interior Department were charged with using the war emergency to seize the Porto Rico Railway, Light & Power Co. at a hearing in Boston November 4 before the U. S. Circuit Court of Appeals. Former Judge John J. Burns of the Massachusetts Superior Court appeared on behalf of the company and Assistant U. S. Attorney John P. Hearn of the Lands Division in Washington, D. C., argued the government's case.

Taken Over in July

The utility was taken by right of eminent domain in July, 1942, by the Federal Works Administration (ELECTRICAL WORLD, July 4, page 9). An acute shortage of "public works" was found in Porto Rico by the FWA, followed thereupon by President Roosevelt's order of expropriation. The government contended in the Porto Rico court that the utility was mainly dependent on fuel oil for its electrical generation for both central station and electric railway service in its territory, and that shortage of this fuel justified expropriation. It was averred that by taking over the power company a maximum of hydro-electric energy could be used throughout the island.

Former Judge Burns denied that there was any shortage of electric power or of fuel oil at the time of seizure, in addressing the court at Boston. He declared that the company is threatened with irreparable damage from having been deprived of the title and possession of its electric utility properties and business; that its profitable business and organization, built up over a period of many years, have been torn from its hands and completely disrupted, and that its entire property and business have been placed in the administration and control of a rival and competing utility organization, the Porto Rico Water Resources Authority. There is a distinct threat that valuable and irreplaceable stores (*e.g.*, copper wire) will be used by the competing system, and that many of the company's customers will be transferred to the Authority and thereby lost to the R., L. & P. company. Furthermore, the company cannot take and use the money deposited in court as estimated compensation without in effect conceding the legality of the condemnation and taking. The R. L. & P. must therefore lose the interest or value of the use of this money if it should ultimately be held that the condemnation and taking were valid. The U. S. government posted $6,250,000 as fair compensation for the property. While the utility has named no sum, the foregoing amount is far below the total which would be likely to be so regarded, if at all. The company's main objective is the return of its property.

Counsel for the company pointed out that if this seizure should be justified by the courts, there is not a public utility system in the United States which cannot be expropriated in the same manner, viz., through the pretext of serving national defense. Senior Judge Calvert Magruder of the U. S. Circuit Court of Appeals asked Mr. Burns if the company contended that President Roosevelt was guilty of bad faith in issuing the order for the seizure, to which Mr. Burns replied:

"As Commander-in-Chief of the Army and Navy in the greatest war in the history of mankind, the President cannot be expected to know the details of everything that goes on at the 101 home fronts, including the front against public utilities. But I do emphatically state that the President was imposed upon by the lesser officials of the Department of the Interior and the Public Works Administrator, and by Governor Tugwell and his associates. When the President asked Congress for war powers under the Lanham act he was not seeking any unusual power to nationalize a private industry, but was seeking only methods whereby local communities could be helped in the war effort while preserving the existing status of ownership wherever possible.

Says Measure Distorted

"I assert without hesitation that the members of Congress who reported out these bills and asked their colleagues to vote speedily on them to meet a national emergency will be horrified to learn that this measure for national security has been twisted and distorted into a colorable device to help out Governor Tugwell in his battle against private utilities."

The Porto Rico company operates both steam and hydro-electric plants and is interconnected with the Authority and through the latter with other electric system facilities. Some 35 municipalities are served with electricity. At the most it is contended that the President's order relates to transmission and distribution facilities and cannot be strained so as to refer to a shortage of generation facilities or other utility properties which are not fairly comprehended within the transmission and distribution category.

RUBBER PARTY—At the International Municipal Signal Association meeting at Philadelphia, recently, Mayor Bernard Samuel was invited to attend the annual party of the United States Rubber Co. Above, the mayor receives his invitation from Harold MacDonald, Eastern sales manager for the company's wire department. Left to right—Ralph Hanes, wire department sales promotion manager, U. S. Rubber Co.; Mayor Samuel; Mr. MacDonld and Harry Simon, chief Electrical Bureau of Philadelphia

Wallace Suggests International TVA

The suggestion of an "international TVA" in the post-war reconstruction period to finance, construct and operate vast regional and international developments, including some built around low-cost hydro-electric power, has been made by Vice-President Henry Wallace, who also heads the Board of Economic Warfare.

Mr. Wallace's proposal was mentioned in his speech before the Congress of American Soviet Friendship in New York on the observance of the anniversary of the Russian Revolution, November 8. The Vice-President declared that the Atlantic Charter offered a "first article" for a necessary United Nations' Charter for collective post-war action. To this charter he suggested "there must be (added) an international bank and an international TVA based on projects which are self-liquidating at low rates of interest."

Mr. Wallace did not attempt an outline of his "international TVA" and it was learned that he does not have a specific plan in mind, that he was speaking more in a generic than a definitive sense. Such an agency, in other words, would not be limited to regional developments like that in the Tennessee Valley, but also might, for example, undertake the development of the combined airway and highway from southern South America across the U. S., Canada and Alaska into Siberia and across Europe, which he also mentioned in his talk "as a starter" for the productive public works program he urged as a means to "stir the imaginations of all the peoples of the world."

Mr. Wallace also is known to feel that the post-war development of such nations as China, India, etc., depend, in large measure, upon international assistance in providing transportation, improved agricultural methods and production and industrialization, and that such development, in turn, will raise the standard of living of all peoples.

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American States Files to Dissolve

A voluntary plan of reorganization was filed with the Securities and Exchange Commission last week by the American States Utilities Co. with a request for an order that the proposed plan be approved. The plan includes simplification of the corporate structure of the company and eventual termination of its corporate existence through distribution to holders of its preferred stocks, the stocks of certain of its subsidiaries, and the subsequent termination of the company by distribution of its remaining assets to the common stockholders.

American States owns 100 percent of the outstanding common stock of Edison Sault Electric Co., Grimes Pass Power Co. and Southern California Water Co. As of May 31, 1942, the company had consolidated assets of approximately $13,740,000.

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Floyd L. Carlisle Dies

Floyd L. Carlisle, chairman of the board of Consolidated Edison Co. of New York, Inc., and of Niagara Hudson Power Corp., died on November 9 at the North Shore Hospital, Glen Cove, Long Island, of an embolism. He was 61 years of age.

Born in Watertown, N. Y., Mr. Carlisle was a lawyer and a banker before he entered the public utility field more than 20 years ago. His rise to a position of influence in the utility field took place at a time when many large power systems were being established. He played a prominent part in the formation of Niagara Hudson Power Corp. in 1929, becoming chairman of the board of directors. He was the guiding figure in the series of mergers of subsidiary companies into Consolidated Edison, which resulted in a greatly simplified corporate structure.

Mr. Carlisle was graduated from Cornell University, where he studied law, in 1903, and was admitted to the New York State Bar two years later. After practicing law in Watertown for several years with his brother, John N. Carlisle, as a member of the firm of Carlisle & Carlisle, he entered the banking field, and from 1910 until 1922 he served as president of the Northern New York Trust Co., also at Watertown. In 1916 he headed a group of business men who purchased control of the St. Regis Paper Co., and, retaining his interest in the company throughout the years, he was chairman at the time of his death.

It was in 1920 that he became identified with the public utility industry, heading a syndicate which bought the Northern New York Utilities, Inc. He became the chairman of the board. In 1921 he established the firm of F. L. Carlisle & Co., Inc., which conducted an investment banking business in New York up to 1934.

In 1926, under Mr. Carlisle's direction, the Northeastern Power Corp. was organized, taking over control of the Northern New York power properties and in addition acquiring a substantial interest in the New England Power Association and Mohawk Hudson Power Corp. In 1928 the Northeastern holdings in New England Power Association were sold and Mr. Carlisle relinquished his position as chairman of the board.

His first connection with the Consolidated Edison group came with his election as a director of the New York Edison Co. in 1930 and the following year he was made chairman of the board of directors of that company. In 1930 he also was elected a trustee and two years later became chairman of the board of Consolidated Gas Co. of New York, which later became the present Consolidated Edison.

During the years 1930-34 he served at various times as a director of the United Corp., Columbia Gas & Electric Corp. and United Gas Improvement Co., and at the time of his death was serving as a director of affiliated companies of Niagara Hudson and Consolidated Edison.

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Board Relieves Utility from Testing Ruling

On petition of Pennsylvania Edison Co., the state Public Utility Commission has granted the utility limited relief from regulations relating to testing of meters recording current used by domestic and small commercial customers and to voltage variations for light and power.

The company had asked that the meter testing regulation requiring that meters used for domestic and small commercial customers and manufactured prior to January 25, 1925, must be tested once every 36 months and meters of the same type manufactured since December 31, 1924, must be tested every 60 months, be modified so as not to require periodic testing for the duration of the war and for such time thereafter as may be necessary.

The commission eased the regulation only for the period beginning October 26 to June 30, 1944.

Clarifies Status on Emergency Ties

The Federal Power Commission announced recently that the emergency use of a connection between facilities of the Connecticut Light & Power Co., Hartford, and the Mystic Power Co., Mystic, Conn., will not affect the Connecticut company under provisions of the Federal Power Act. Use of the connection will make possible additional power supply to the system of the Narragansett Electric Co., in the Westerly, R. I., area, through a transfer of energy at a rate not to exceed 10,000 kva. from the Mystic Co.'s generators to help carry the Narragansett company's increased war loads. Resulting deficit in the Mystic company's power supply will be met by a transfer from the Connecticut company's system through the interconnection.

Will Save 25,000 Tons of Coal

A similar FPC ruling was handed down in the case of the newly approved wartime use of a 25,000-kw. interconnection at New Britain, Conn., between the transmission lines of the Connecticut Light & Power Co. and the Connecticut Power Co. A saving of approximately 25,000 to 30,000 tons of coal per year in the New England and a corresponding reduction in the use of rail transportation facilities will result from the interconnection, it was said.

In another order the FPC ruled that emergency use of existing interconnections between Texas Electric Service Co. and the West Texas Utilities Co. to augment power supply through the Southwestern "power pool" will not establish Texas Electric Service Co. as an interstate utility subject to the commission's jurisdiction. Primary purpose of the emergency use of the ties between the two companies is to make electric energy available through the Southwestern Light & Power Co. to the Defense Plant Corporation's aluminum plant at Lake Catherine, Ark. The existing connections are to be utilized by removing reverse current relays which now assertedly prevent energy from flowing between Texas Electric and West Texas Utilities, which is classified by the commission as an interstate utility.

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Power Salesmen Discuss Wartime Job

The radical changes that have come about in the work of power sales engineers were the theme of the fall meeting of the Interstate Power Club in New York, November 10. While the power salesman is mighty busy with the problems of service to individual customers, he is no longer selling kilowatts and kilowatt-hours, but is entirely occupied with where and how they can be used most effectively, said Edwin M. Clapp, Georgia Power. C. P. Bernhardt, Westinghouse, presented a complete prescription of methods to employ the overload capacities of motors, thus to save steel and copper in new installations and to improve efficiency of older ones. The urgencies of proper maintenance of electrical equipment and how to do it were explained in detail by R. C. Moore, Allis-Chalmers. And the difficulties of the electrical contractor getting a three-cornered squeeze in these difficult times between labor, difficulties in obtaining materials and exiguous profits were exposed by Edward J. White, Newark, N. J.

New officers elected by the club for the year are: Chairman, Grant Parry, New Jersey Power & Light; vice-chairman, S. A. Moore, Public Service of New Jersey. Directors: E. A. Brand, Buffalo, Niagara & Eastern Power; Robert G. Ely, Public Service Electric & Gas; J. O. Covington, New York & Queens Electric Light & Power; F. T. Brooks, Philadelphia Electric; D. S. Schaab, Rockland Light & Power.

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Reserve Utility Decision

U. S. Court of Appeals has reserved decision in an appeal of Hartford Electric Light Co., Hartford, Conn., from an order of the Federal Power Commission requiring the utility to adhere to accounting rules of the board.

MEETINGS

Previously Listed

Great Lakes Power Club—Fall meeting, Palmer House, Chicago, Ill., November 20. W. M. Woll, president, Commonwealth Edison Co., 72 W. Adams St., Chicago, Ill.

American Society of Mechanical Engineers — Annual meeting, Astor Hotel, New York, N. Y., November 30-December 4. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

National Exposition of Power and Mechanical Engineering — Madison Square Garden, New York, N. Y., November 30-December 4.

National Association of Manufacturers—Congress of American Industry, Waldorf-Astoria Hotel, New York, N. Y., November 30-December 4. G. G. Geddis, 14 West 49th St., New York, N. Y.

American Society of Agricultural Engineers—Fall meeting, LaSalle Hotel, Chicago, Ill., December 7-9. Raymond Olney, secretary, St. Joseph, Mich.

Technical Valuation Society—Annual forum, New York, N. Y., December 12. W. C. Fisher, chairman, 33 West 39th St., New York, N. Y.

American Society of Civil Engineers — Annual meeting, headquarters, New York, N. Y., January 20-22. George T. Seabury, secretary, 33 West 39th St., New York, N. Y.

American Institute of Electrical Engineers — Winter convention, New York, N. Y., January 25-29. H. H. Henline, secretary, 33 West 39th St., New York, N. Y.

Job Training Information Urged

Recognition of job training as an integral part of a sound safety program led the accident prevention committee of the Edison Electric Institute, meeting in Chicago recently, to set in motion plans for assembling information on successful training and safety programs in use by member companies. C. N. Rakestraw, Cleveland Electric Illuminating Co., will compile the information.

"It is training that is going to improve our accident situation. We must come to the realization that job training and accident prevention are inseparable," declared W. R. Smith, Public Service Electric & Gas Co. of New Jersey in an open discussion of the War Manpower Commission's J.I.T. (Job Instructor Training) program. "The average foreman has no idea how to instruct," Smith stated.

J.I.T. Arouses Interest

Committee members evidenced interest in the J. I. T. program as a means of imparting to foremen a systematized method of passing job "knowhow" along to workmen. The ten-hour J.I.T. course for job instructors is given without charge to war industries (utilities included) under direction of the Training Within Industry Branch of the War Manpower Commission, Washington.

T. R. Claffey, W. H. Salisbury & Co., Chicago, read a paper on wartime trends in the manufacture of lineman's rubber protective equipment which he had delivered before the public utility section of the recent National Safety Congress. Claffey expressed the opinion that adequate, safe lineman's protective equipment would be available for the duration, although possibly it would not be as durable and long lasting as peacetime products. Increasing amounts of reclaimed material may have to be used, he asserted.

In a discussion of low-voltage accidents in the United States, Clifford Boulet, Wisconsin Public Service Corp., Milwaukee, cited statistics compiled from an analysis of an E.E.I. file of newspaper clippings, reporting electrical accidents involving 500 volts and under. Of 264 fatal low-voltage accidents in 1941, some 155 were industrial accidents, 103 were residential and six utility. Sixty-four percent of all fatalities resulted from defective equipment, 30 percent from defective wiring. Of the 264 total, 144 occurred during June, July and August.

Accidents resulting from the "cutting out" of lineman's climbers were characterized in discussion as one of the largest single causes of pole-line accidents.

Output Curve Dips Slightly

After an almost uninterrupted rise during the past month, the output curve showed a slight falling off in the past week. Figures on the amount of electrical energy distributed by the light and power industry for the week ending November 7 showed 3,761,961,000 kw.-hr., compared to the previous week's figures of 3,774,891,000 kw.-hr., according to the Edison Electric Institute. The figure for the latest week represented an 11.7 percent increase over the corresponding week in 1941—the same gain over last year registered in the previous week.

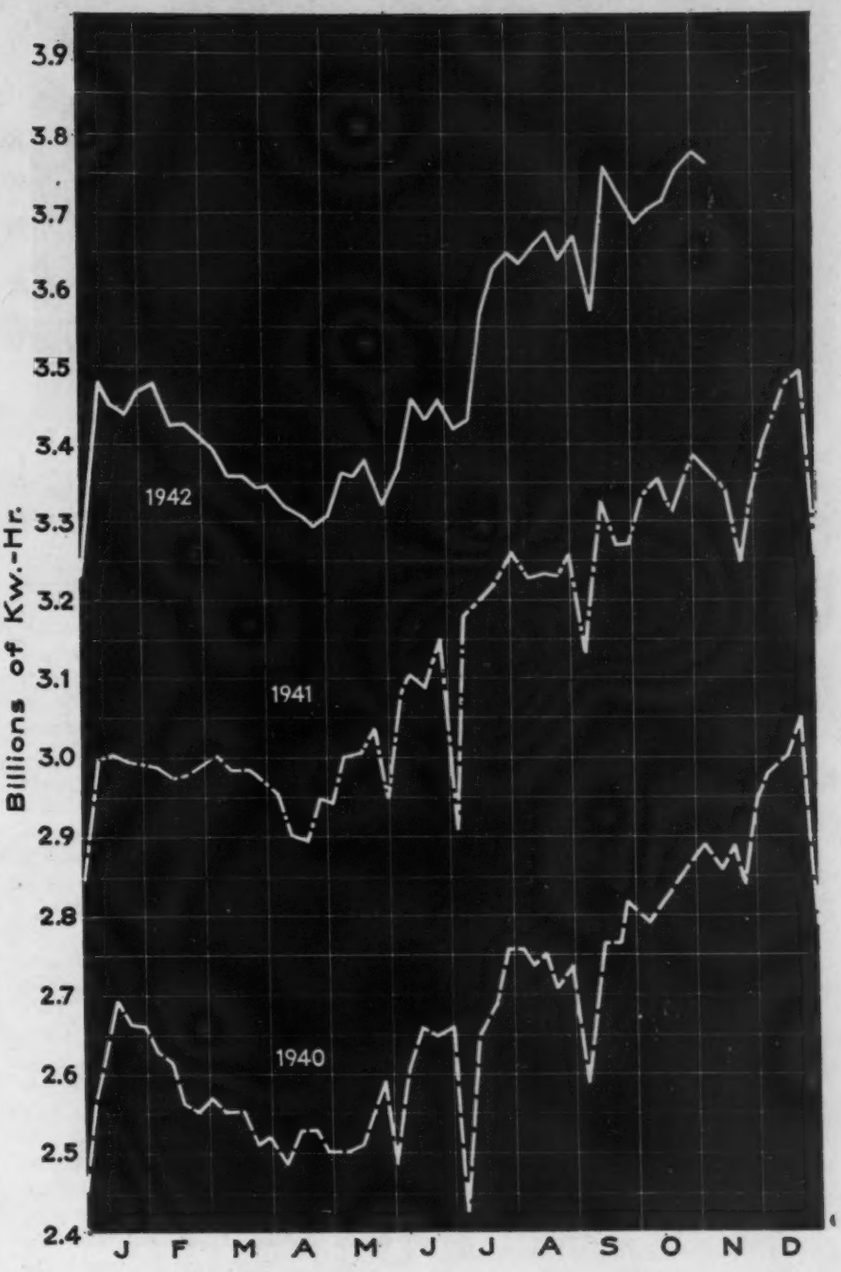
All the major geographic sections of the country showed a gain in the percentage changes for the November 7 week over the previous week, in comparison with the 1941 figures. The Pacific Coast region, however, still leading the rest of the country with a 28.8 percent gain for the latest week, dropped from a 31.2 percent increase registered the week previous.

Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
Nov. 7	3,762	Nov. 8	3,369	Nov. 9	2,858
Oct. 31	3,775	Nov. 1	3,380	Nov. 2	2,882
Oct. 24	3,752	Oct. 25	3,341	Oct. 26	2,867
Oct. 17	3,717	Oct. 18	3,313	Oct. 19	2,838
Oct. 10	3,702	Oct. 11	3,355	Oct. 12	2,817
Oct. 3	3,683	Oct. 4	3,330	Oct. 5	2,792
Sept. 26	3,720	Sept. 27	3,273	Sept. 28	2,816
Sept. 19	3,757	Sept. 20	3,273	Sept. 21	2,769
Sept. 12	3,571	Sept. 13	3,322	Sept. 14	2,773
Aug. 29	3,640	Aug. 30	3,261	Aug. 31	2,736

Percent Change from Previous Year

	Week Ending		
	Nov. 7	Oct. 31	Oct. 24
New England	+ 2.4	+ 0.8	+ 4.1
Mid-Atlantic	+ 4.7	+ 4.5	+ 5.6
Central Industrial	+ 6.9	+ 6.8	+ 7.9
West Central	+10.4	+ 8.9	+10.6
Southern States	+20.0	+19.9	+17.6
Rocky Mountain	+ 9.7	+ 8.8	+13.1
Pacific Coast	+28.8	+31.2	+30.7
Total United States	+11.7	+11.7	+12.3



Control Auxiliary Generator Production

Auxiliary generating equipment has been placed under production schedule and delivery allocation control by WPB in amendment No. 4 to Order L-117, which applied originally to turbines and generators.

Among the items of equipment affected by the amendment are steam-generating boilers for operation at pressures above 100 psi., steam surface condensers (except for Navy orders), steam engine generator units, frequency changers, synchronous condensers and transformers above 500 kva.

Under the order manufacturers will submit monthly reports covering existing production schedules, which may be modified by WPB's Power Branch so as to integrate delivery of large items of power equipment for individual power plant jobs.

•

Canadian Output Off in September

Output of central electric stations in Canada during September was 2,946,611,000 kw.-hr., compared with 2,989,675,000 in the previous month and 2,866,647,000 in the corresponding month last year, the Dominion Bureau of Statistics reported recently.

The total for the nine months ended September was 27,514,325,000 kw.-hr., compared with 23,900,261,000 in the same period of 1941.

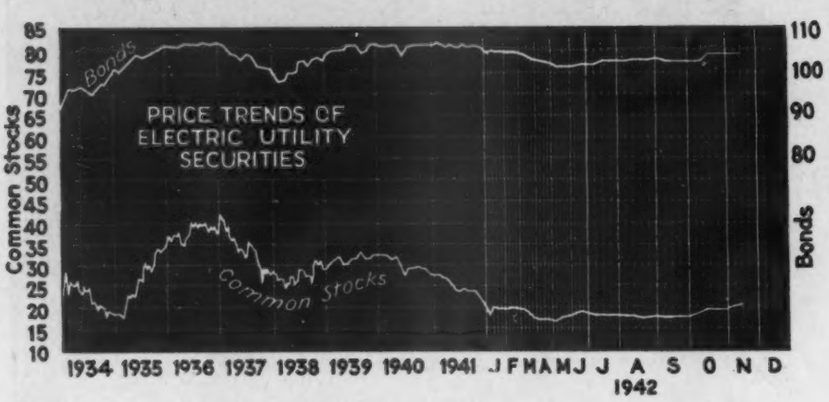
Exports to the United States dropped from 195,145,000 kw.-hr. in August to 185,202,000 in September.

•

Approve Midland Utilities' Sale of Hobart Company

The SEC last week approved a proposal by trustees of the estate of Midland Utilities Co. for the sale of assets of its subsidiary, Hobart Light & Water Co., to the Northern Indiana Public Service Co. for $500,000. Under the plan Northern Indiana will make payment with 69,500 shares of its no-par common stock. Following the transactions, Hobart Light & Power will be dissolved (ELECTRICAL WORLD, August 1, page 20).

Utility Securities Continue Upward Trend


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
Bonds
Common Stocks
Common Stocks
Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1934 1935 1936 1937 1938 1939 1940 1941 J F M A M J J A S O N D
1942

Prices of electric light and power stocks maintained their upward trend during the past week. "Electrical World" index went to 20.4 from 20.0 the previous week; last year, 21.2. Bonds advanced to 103.7 from 103.5; last year, 105.7

International Files to Recapitalize

International Utilities Corp. recently filed a voluntary plan of recapitalization with the Securities and Exchange Commission, with the request that the proposed plan would be consolidated with proceedings under the "death sentence" provisions of the Holding Company Act, now pending before the commission. One of the principal features of the plan is a proposal that International be merged with Dominion Gas & Electric Corp., one of its major sub-holding units, as suggested by the company during oral argument before the commission, early in September (ELECTRICAL WORLD, September 19, page 76).

The plan contemplates that with the merger with Dominion, a Delaware Corp., the company would divest itself of control of Rockland (N. Y.) Gas Co., Inc., only operating utility subsidiary of International in the United States, and become exempt from regulation under the Holding Company Act. The new company, according to William B. Yeager, president of International, will own operating subsidiaries in Canada and the control of General Water, Gas & Electric Co., the other sub-holding unit in the International system, which would only operate water companies under the proposed arrangement.

As of June 30, 1942, International had outstanding 98,967 shares of $3.50 prior preferred stock, 66,652 shares of $1.75 preferred, 88,126 shares of class A stock and 1,252,266 shares of class B stock. It is authorized to issue four classes of stock—600,000 shares of prior preferred, 1,000,000 shares of preferred and 154,708 shares of class A, no par value, and 2,500,000 shares of class B, par value $1.

The corporation proposes to reduce the authorized number of shares of $3.50 preferred to 100,000 and to change them from no par to $50 par value; to issue 400,000 shares of common, $1 par value; reclassify each share of $1.75 preferred into 2.5 shares of common; reclassify each share of class A now outstanding with accumulated dividends into one share of common, and to reclassify each share of class B outstanding into 1/100 of a share of common.

While International has no funded debt, Dominion, its subsidiary, has outstanding $3,946,500 face amount of 6½ percent collateral trust bonds, due July 1, 1945. As of July 23, the corporation has acquired $842,000 face amount of these bonds. It is proposed in the plan to reduce the bonds through cash and other liquid resources to $2,000,000 and then use this credit to borrow $2,000,000 to retire or acquire the remaining bonds. Coincident with the borrowing, International would be merged into Dominion.

Utility Reports

	Net Income 1942	1941
*Alabama Power	$3,206,987	$3,304,864
*American Light & Traction	5,934,075	6,029,899
*American Water Works and Elec. and subs.	2,940,892	3,928,741
*Central Power & Light	1,425,456	1,368,828
*Commonwealth Edison and subs.	23,943,452	27,257,511
*Connecticut Lt. & Power	3,444,769	3,817,199
*Consumers Power	8,119,823	9,553,510
*Engineers Public Service and subs.	3,207,383	4,656,128
*Georgia Power	5,443,802	5,273,794
*Jersey Central Pwr. & Lt.	1,881,425	2,295,354
*North American and subs.	19,308,862	19,131,066
*Ohio Edison	3,220,686	3,901,441
*Pacific Pwr. & Lt. and sub.	726,573	821,707
*Philadelphia Elec. and subs.	17,343,694	19,906,093
*Rochester Gas & Electric	827,148	1,013,561
*Wisconsin Pub. Serv. and sub.	1,659,744	1,740,068

*Twelve months ended September 30.

Niagara Falls Rejects FPC Plan

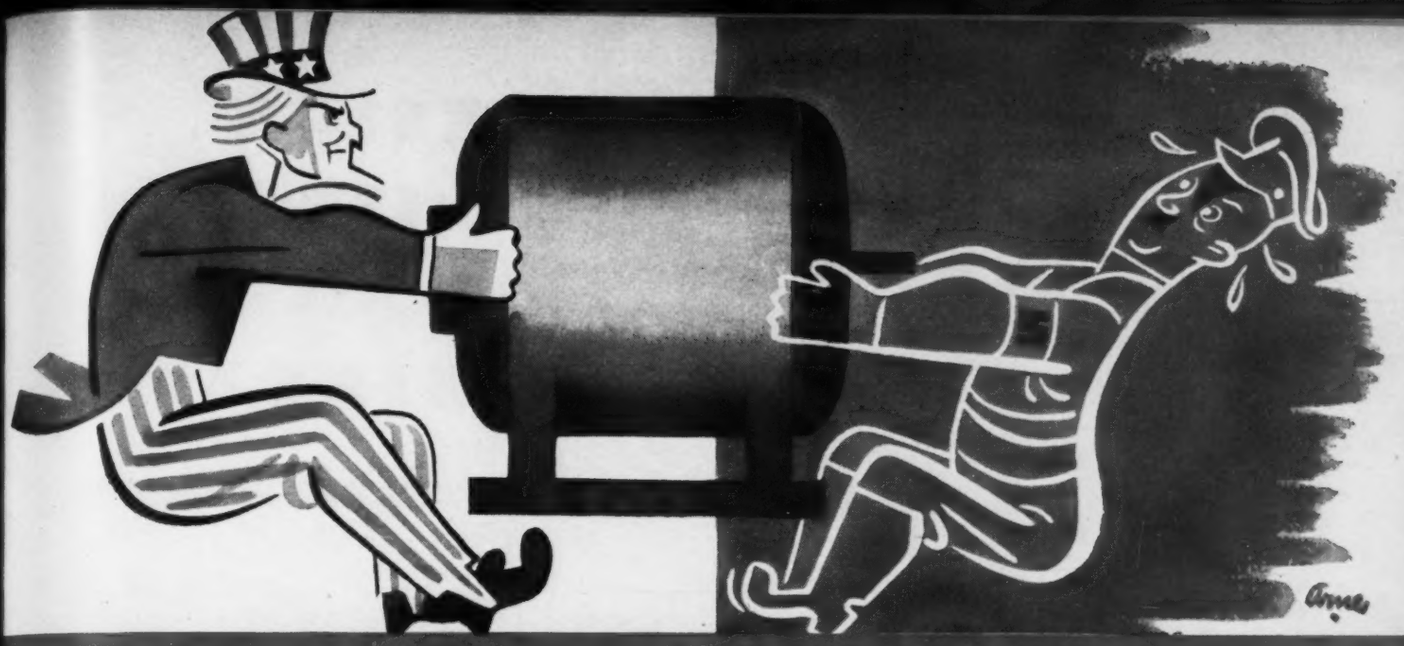
Following receipt of the Federal Power Commission's amendatory order allowing the Niagara Falls Power Co. the choice of charging to capital surplus the amount of approximately $15,500,000, which had been previously disallowed in the cost of project No. 16 at Niagara Falls (ELECTRICAL WORLD, November 7, page 20), Col. William Kelly, vice-president of Niagara Falls Power and president of Buffalo, Niagara & Eastern Power Corp., released a statement recently in which he said that Niagara Falls Power could not accede to the alternative suggested by the FPC.

"The amendatory order in no way changes any of the basic requirements of the commission's original order of June 9, 1942," Col. Kelly stated. "The essence of the original order was that the company should write off approximately $15,500,000 from its surplus; the essence of the amendatory order is to suggest that the company reduce capital by that amount."

Replying to queries rising from the statement of Leland Olds, FPC chairman, that "company officials would be able to declare dividends impounded heretofore," Col. Kelly emphasized that the commission chairman apparently considered this statement to be justified by reason of the provision of the amendatory order of the FPC giving the company the choice of charging the disputed amount to capital surplus. The commission's release neglected to state that this would require the reduction of the common capital of Niagara Falls Power Co. by this amount, he said, and fails to consider the effect this might have on the accounts of Buffalo, Niagara & Eastern Power Corp. and its ability to pay dividends to its preferred-stock holders. It will be recalled, Col. Kelly added, that the FPC order of June 9 was one of the principal factors which caused Buffalo, Niagara & Eastern Power to suspend payment of its preferred dividends.

It was further pointed out by Col. Kelly that the FPC suggestion would have to be approved by the SEC and New York's Public Service Commission. "In the event that the company is successful in its court review of the FPC order," he said, "the amount by which the common capital of the company would be reduced to create the reserve suggested could not be reinstated without the consent of those commissions."

At about the time Col. Kelly's statement was being released the Circuit Court of Appeals announced that it had reserved decision on a petition by Niagara Falls Power Co. seeking a stay of execution of the FPC June 9 order.



HOW MUCH OF YOUR MOTOR CAPACITY IS ON THE ENEMY'S SIDE?

APPLY THIS GUIDE

(based on recommendations of WPB)

TO DECIDE UPON MOTOR SIZE

1. For open-type a-c motors (continuous rated 40 C) where ambient temperatures are generally below 40 C, use motors rated as low as 80% of actual required horsepower. EXAMPLE: Where 9.3 is required horsepower—9.3 x .80 = 7.44; select a 7.5-hp motor.

2. For a-c or d-c motors rated on a 50 C or 55 C basis, where ambient temperatures are generally below 40 C, use motors rated as low as 91% of actual required horsepower.

3. For open-type d-c motors (continuous rated 40 C) where ambient temperatures are generally below 40 C, use motors rated as low as 87% of actual required horsepower.

4. In selecting motor types, base your choice on these conservation factors, wherever operating conditions permit:

   Use standard open motors instead of "specials"—high-speed instead of low-speed—single-speed instead of multiple—single-winding rather than two-winding—a-c instead of d-c—squirrel-cage instead of slip-ring—440-volt motors instead of 220 (or use 2200 volts above 100 hp).

An up-to-the-minute guide on wartime motor selection is now included with each copy of the G-E MOTOR FITNESS MANUAL, a booklet prepared to help you get the most out of every motor you now have in service. For your copy, call or write your local G-E office.

MOTORS NEEDLESSLY LARGE FOR THE JOB—plus the oversize distribution circuits they require—may be 25 per cent or more on the side of the Axis! That's the percentage of copper and other scarce materials frequently wasted by overcautious motor specifications—by buying the "next larger size" than a machine actually needs.

The extra amount of critical material used in the oversize motor itself is only part of the loss. Operating a motor continuously below its rated capacity can mean wasted copper all the way back to the power plant. Thus, even your present motors should be so applied as to avoid "over motoring," wherever possible.

The WPB joins in urging you to modify your peacetime motor policy in the cause of conservation. By following its recommendations whenever you buy or install a motor, you'll be helping to make more metals available where they're most needed to win the war. *General Electric, Schenectady, N. Y.*

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

BUILDER OF TRI-CLAD MOTORS

GENERAL ELECTRIC

750-173-8030

HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

"A" 3-Phase System Has Grounding Merits

By WILLIAM T. TAYLOR
New York, N. Y.

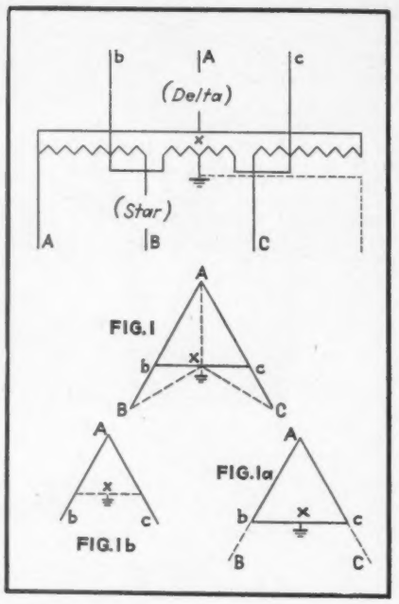
The common three-phase power systems of today are the "Y," the "Δ" and the "V," the "T" and others. The three-phase power system introduced here is called the "A" system.

For secondary distribution service in particular such transformer connections as the three-phase closed-delta (Fig. 1a) and the three-phase open delta (Fig. 1b) represent common practice. The ground connection at the center of one transformer (Fig. 1a) is also common practice. The voltage to ground for two of the phases is 86.6 percent and the voltage to ground for the other phase is 50 percent. Each single-phase winding is usually in two equal parts, hence the ground connection can be made on any transformer.

The closed-delta connection permits of a change to star connection for higher voltage operation, thus changing the system phase angular relations. The change of voltage is 173.2 percent across phases and a true neutral grounded position is obtained, which is impossible with the delta connection; the voltage across all phases to ground being 57.7%.

Distribution requirements seek (1) operation of phases with the same minimum voltage to ground, (2) a closed circuit in the transformation (such as a closed delta) to minimize unbalance of voltages across phases and neutral, (3) change to a higher or lower voltage without change of the system angular phase relations, (4) use of those transformers connected in star which are abandoned because a higher voltage is required.

For the delta connection (1) cannot be attained, and for the star connection (2) cannot be attained. For a change from delta to star connection, or vice versa, (3) cannot be attained, and for a star connection (4) is already operating at its highest voltage limit and the transformers cannot be used for any higher voltage.



CENTER of bar of "A" connection affords equality of to-ground potentials

Fig. 1 shows a closed-delta and a star connection on three single windings, with maximum voltage between A-B-C. Delta/star connections may be made on both the independent primary and secondary of two-winding transformers. For simplicity, Fig. 1 shows a delta/star connection on three single-phase auto-transformers. For a change from open-delta connection and change from closed-delta connection to the "A" system, the voltage conditions would be

Connections	Change from Open-Delta	Change from Closed-Delta
Across phases	100%	150%
Across closed delta.	66.6%	100%
Neutral to any phase	57.7%	86.6%

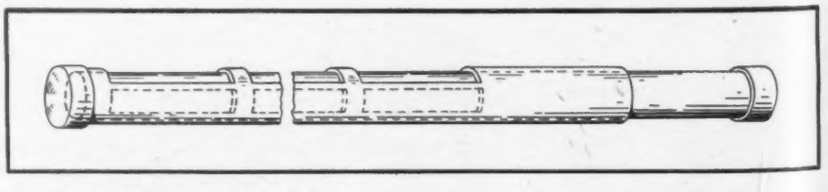
The maximum voltage stress to neutral grounds is the same as that of the closed-delta connection, but the line or phase-to-phase voltage of the "A" system has been increased to 150 percent without changing the phase relations. Line voltage is usually required while still maintaining the old or original connections, and there is some objection to isolating new service connections and cutting off the supply. Changing over to the "A" system overcomes these objections.

•

Pulverized Coal Sampling Device

A vacuum cleaner is a handy device for pulling coal samples out of the suction line between pulverizer mill and burner and is frequently so employed. But a better and a simple way is used at Plant Atkinson of the Georgia Power Company. Credit for this improvement goes to E. Aagaard of the Georgia Power Company production department.

As shown in the accompanying



SLOTTED TUBES for coal sampling.

New!

METAL-ENCLOSED
Oil Fuse Cutout Assemblies

1 ***For Economical Short-circuit Protection and Switching***

2 ***Easy to Install***

3 ***Single- or 3-phase Designs***

Complete metal-enclosed, three-phase, oil fuse cutout assembly mounted on apparatus. Assembly for separate mounting is shown in illustration above.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

These new cutout assemblies, for wall or direct-to-apparatus mounting, permit totally metal-enclosed installations, either single- or 3-phase. They save installation labor because each unit is factory-assembled with flexible, insulated cable leads ready for connection to either single- or multi-conductor cable. The leads enter the individual cutouts above the oil level, thus preventing loss of oil. Switching is done by merely throwing the handle through a 90-degree arc. Fuse carriers can be removed separately without disturbing the gang-operating mechanism.

Cutouts Proved by Service

G-E oil•fuse cutouts, Type D&W, distinguished through more than 20 years for reliability and safety in service, are recognized for high-current-interrupting ability, facility for switching, high-speed operation, and quiet performance—in both central station and industrial installations.

Approved for Indoor Application

These metal-enclosed assemblies are particularly well adapted for use (indoor or outdoor) in industrial plants for branch circuits, individual transformers or banks, motors, control apparatus, and electric-heating and other equipment. The use of oil fuse cutouts for indoor application has long had the approval of the National Electrical Code.

Available Models and Ratings

The new assemblies can be supplied for wall or direct-to-apparatus mounting, with openings for conduit, cable, or pothead connections and for single- or three-phase applications.

For Short-circuit Protection and Switching		For Switching Only (with copper blade instead of fuse link)	
Volts	Amperes	Volts	Amperes
2500	100, 200, 300	2500	150, 250, 350
5000	50, 100	5000	150, 250
7500	100	7500	150

Ask your G-E representative for complete information. Or, write for new publication, GEA-3904. *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

You can spin off the contact chambers of the smaller breakers in less than a minute—and inspect the oil-blast contacts without disturbing vital adjustments.

It's easy to lower and raise the tanks with the easy-to-operate tank lifters.

YOU'LL value the ease with which K-339's can be inspected. Today, especially, you want to know—yes, *see*—that your power breakers are in tip-top condition.

And you'll see, in periodic inspections, why K-339's are noted for long-term dependability. You'll see, for example, that even after long service the heavy butt-type contacts retain their current-carrying ability without maintenance.

You can get K-339 breakers for dependable protection of all systems from 15 to 230 kv. Ask your G-E office for further information.

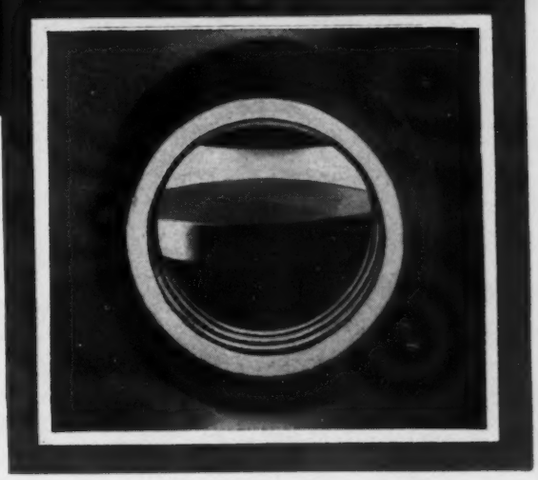
General Electric Company, Schenectady, New York.

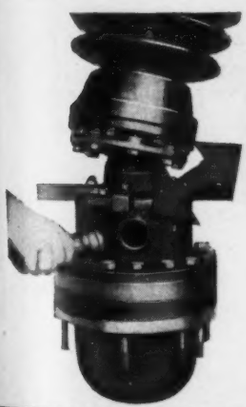
QUICK INSPECTION

ONE REASON WHY K-339 BREAKERS GIVE YOU AN EXTRA MEASURE OF PROTECTION

Though K-339 breakers require little or no maintenance, all parts are easily accessible. Ease of inspection and maintenance means extra assurance that these breakers will always be ready for instant action.

You can enter the tanks of the larger breakers through the new convenient hinged-cover manhole—





—and you can look at the oil-blast contacts after merely removing an inspection plug.

GENERAL ELECTRIC

869-5-7400

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

sketch, it employs two concentric tubes of brass pipe, each capped at one end and with slots about 120 deg. wide cut along their lengths. Thus when the inner tube is turned the slots may be opened or closed. The length of the tube assembly is sufficient to extend across the diameter of the fuel suction pipe with enough over for a hand hold. In operation the double tube is inserted in the pipe through a small hole provided for it. The tubes are turned to open the slots which are faced counter to the flow of coal in the pipe. After an interval to allow the tube to fill the slots are closed and the tube withdrawn, charged with a sample of the pulverized coal flowing through the suction line.

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Condenser Tubes Stretched in Place

While the stretching of condenser tubes has been practiced in utility generating stations for some time, the stretching of tubes *in place* within condensers, as done at the Cahokia station of the Union Electric Company of Missouri, at St. Louis, is an innovation. The hydraulic ram apparatus used for the purpose is shown in the accompanying drawing.

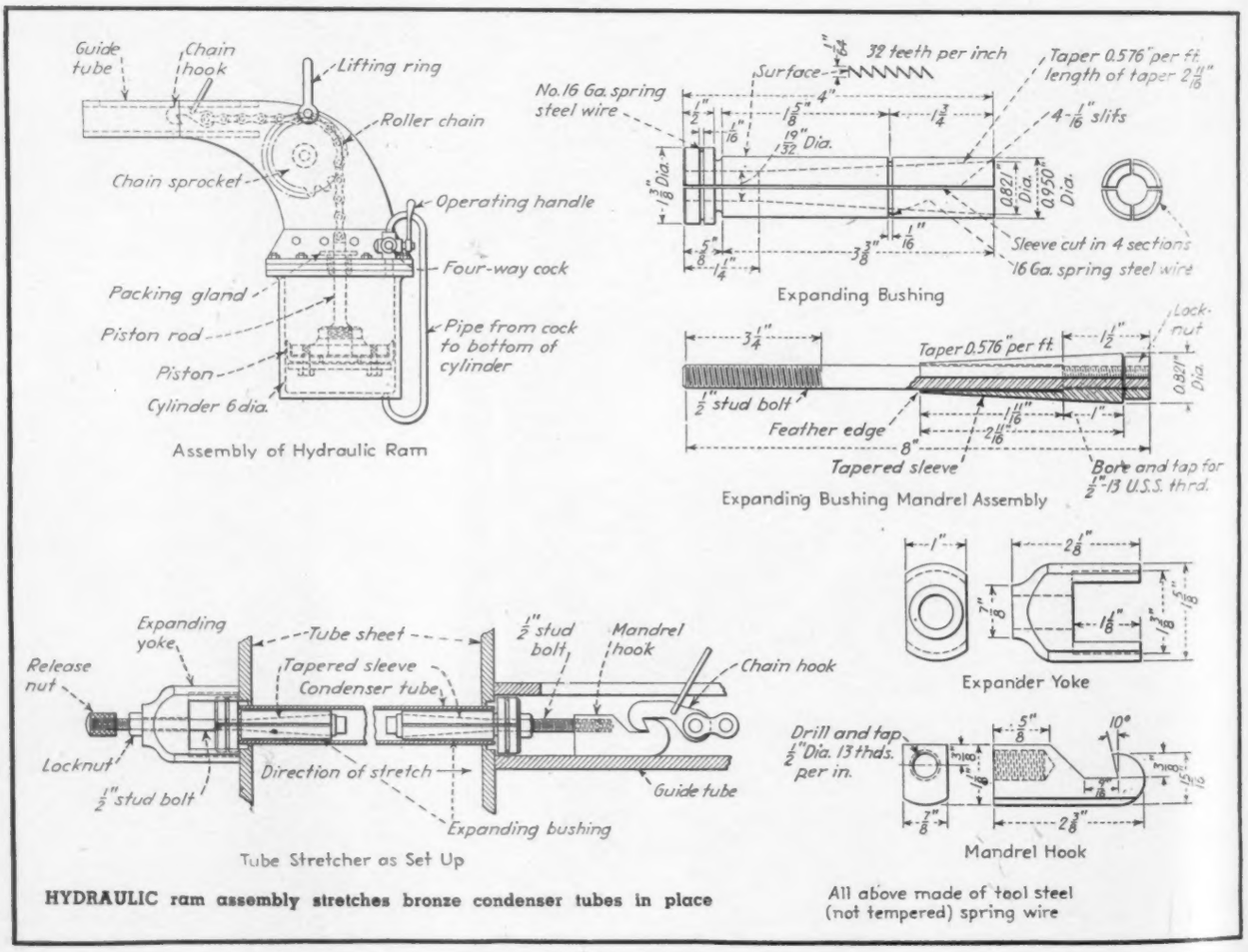
Need for stretching of tubes at Cahokia arose from de-zincification of condenser tube packing nuts and the resulting deterioration of the packing in the first $\frac{7}{8}$ in. of the bronze tubes, at the inlet end. It seemed needless to remove the entire tube from the condenser to stretch it the fraction of an inch required for repacking. As a result, the described practice was developed by Edward Luxemberg, mechanical superintendent, Cahokia station.

The hydraulic ram device used consists of three basic elements: (1) An expanding-bushing, tapered-mandrel assembly, of which there are two, used for gripping the inside of the condenser tube ends; (2) an expander yoke which in conjunction with one of the expanding-bushing mandrel assemblies holds the stationary end of the tube, and (3) a hydraulic ram assembly which, acting under a water pressure of 250 lb. psi., applies the tractive force to the free end of the tube, through the second expanding bushing mandrel.

Gripping element of the device is the expanding-bushing, tapered mandrel assembly referred to. It consists of a serrated cylindrical sleeve cut into four longitudinal sections and held together at two points by 16-gage spring steel wire hoops, countersunk. The cylindrical sleeve shown has a tapered bore to take a mating tapered mandrel threaded at one end. Thus as the mandrel is drawn into the expanding sleeve bushing, its sections spread, against the spring pressure, allowing the serrated surface to grip the inside surface of the condenser tube.

At the stationary end of the tube being stretched, the threaded end of the tapered mandrel mates with an expander yoke that bears against the condenser tube sheet in the manner shown in the assembly drawing shown below.

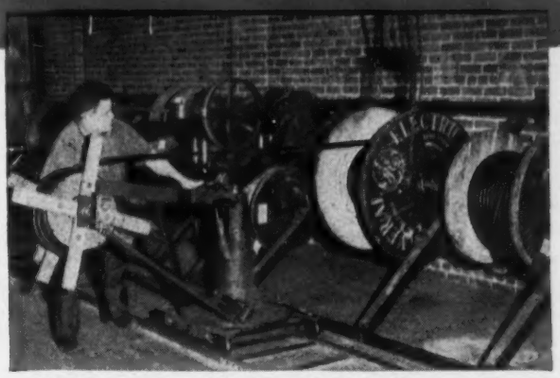
At the free end of the condenser tube the threaded end of the tapered mandrel, within the expanding sleeve



HYDRAULIC ram assembly stretches bronze condenser tubes in place

All above made of tool steel (not tempered) spring wire

G-E Wiring Materials Distributors Offer Supplies for Wartime Wiring Efficiency



Cal Sherman, stock clerk, Havens Electric Company, Albany, N. Y., G-E distributor, is pleased with the building wire stockroom equipment. This equipment includes a large crane running on overhead tracks used for lifting large reels from the floor to racks and a portable reel and measuring machine which runs on a track and permits any size of wire to be taken off any reel.

E. C. Schuman (right), sales manager, Southern Tier Electrical Supply Company, Binghamton, N. Y., G-E distributor, and Sven Perman, shipping room manager are checking stock preparatory to filling customer's order for war project wiring materials. Mr. Schuman is considered one of the best priority authorities among electrical jobbers in central New York.

●Avoid delays caused by electrical breakdowns. The G-E Wiring Materials Distributor near you can provide wiring supplies—for new wiring systems, for wiring system conversion or for wiring system maintenance—that will give dependable service. These wiring materials are all high quality.

G-E Wiring Materials Distributors handle 5 different conduits, 5 different types of building wire and hundreds of wiring devices and boxes and fittings all made by one manufacturer. The variety and durability of these materials make them ideal to use in war projects.

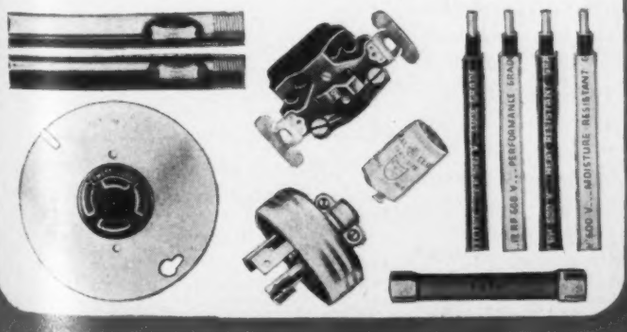
Moreover, G-E Wiring Materials Distributors will be glad to help you in many ways in addition to supplying materials. They will help select materials suitable for your purposes . . . help plan wiring . . . give priority advice. . . make suggestions on protective wiring. Take advantage of these services. See your G-E Wiring Materials Distributor.

Henry Oestreich (left), superintendent of the Black Hills Power and Light Company in Provo, South Dakota, field office, is discussing materials suitable for important job with F. E. Neuberger, salesman, General Electric Supply Corporation, Denver, Colo., covering western Nebraska and southwestern South Dakota territory. At far right, Miss Nellie Hubbard, stenographer for Black Hills Power and Light Company.

H. E. Resch (left), salesman, General Electric Supply Corporation, Indianapolis, Ind., is here helping to choose suitable wiring materials for a special lighting job while calling on H. A. King, engineer and estimator for Porter, Glare and Glass, Inc., Indianapolis.

G-E WIRING MATERIALS

For complete information on G-E conduit, wire and cable and wiring devices suited to your needs, see the G-E Wiring Materials Distributor near you. Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.



GENERAL ELECTRIC

bushing, mates with a mandrel hook. This hook engages a corresponding hook on a roller chain that passes over a sprocket to the rod of a 6 in. diameter hydraulic piston. Traction is applied to the mandrel hook by admitting water under 250 lb. pressure to the top of the hydraulic cylinder through a four-way cock. This cock also serves to release tension on the pulling chain after stretching. Tension on the mandrel hook draws the tapered mandrel into the expanding bushing sleeve gripping the tube as it is stretched. Control over the extent of stretching is obtained by operating the handle controlling admission of water to the hydraulic cylinder. An extensometer between the chain hook and tube sheet is used to measure the amount of stretch.

Using ten sets of tube stretchers simultaneously it is possible to stretch 11,000 condenser tubes in about 18 hours, it is reported. This time does not include time required to cut the tubes off and repack them, however.

Water pressure of 250 lb. used in the hydraulic cylinder is obtained from plant water supply mains through a booster pump.

Developed during the summer of 1941, the device has proved of increasing worth in recent months because of the necessity of conserving bronze and similar strategic materials.

Operating engineers report that the device during its period of operation has broken about 1/10th of 1 percent of the tubes stretched.

•

Changed Operation Raises Station Output

By RALPH R. HAWKINS
General Superintendent, Patchogue Electric Light Company, Patchogue, N. Y.

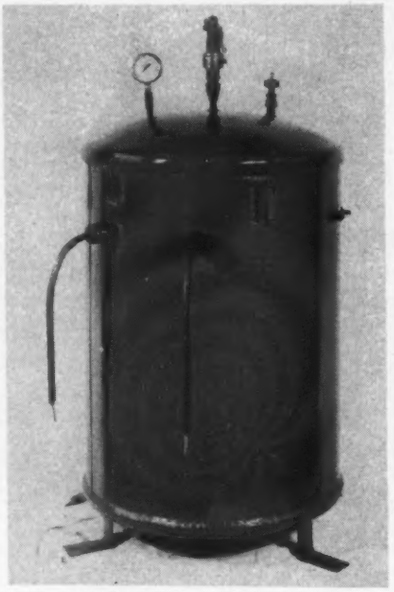
Three of the five Heine boilers have been operated at 185 lb. per square inch to supply steam to the 3,750-kva. turbo-generator. Recently, however, the station output has been increased from 2,900 to 3,300 kw. by a change in operating hook-up. The smallest (250-hp.) boiler is now run at 170 psi. and supplies steam only to the auxiliaries. Pressure on the two other (405 and 300 hp., respectively) has been raised to 205 psi. and they supply a 3,000-kw. turbine. In this way it has been found practicable to run the unit at 10 percent over rating for the duration of the peak. All three boilers have Westinghouse stokers. Of the two reserve boilers one is oil-fired and the other hand-fired.

•

Compressed Gas for Transformers

By REX T. STAFFORD*
Assistant Manager, Electrical Department, Allis-Chalmers Manufacturing Co., Pittsburgh

In 1941 approximately 44,000,000 gallons of oil were used in transformers built in the U.S.A. and this figure will probably be exceeded. Use of compressed nitrogen as an insulating medium instead of oil in transformers would effect a substantial saving in the requirements for oil. Nitrogen and "Freon" have excellent dielectric properties at pressures between 100 and 140 psi. absolute.



COMPRESSED-GAS-FILLED transformer (50 kva., single phase, 2,400/240 volts, 60 cycles) designed for operation on 150-psi. gas pressure

A small transformer has been manufactured for exploring this possibility. It has internally mounted bushings, pressure gage, safety valve, thermocouple entrance and compressed air valve. Heat runs and 60-cycle dielectric tests indicate that the transformer is in every way practical for reliable commercial operation. The impulse characteristics of compressed gases are not as good as those of conventional transformer oil, but it appears that there is a field, at least in medium voltages, for use in subways, vaults and buildings protected against lightning. Cost may somewhat exceed that of the oil-filled unit.

On large key installations the transformer should be provided with its own air compressor, moisture absorber and automatic governor for starting the compressor should the pressure fall. For smaller units a cylinder of compressed nitrogen can be substituted for the compressor.

*Adapted from prize-winning paper in recent contest of Compressed Air Institute.

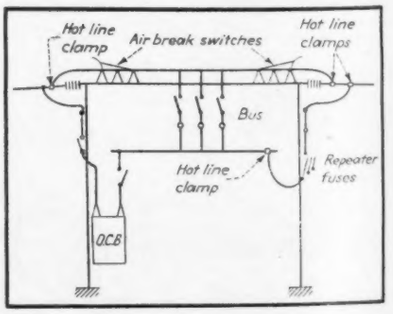
•

Hot Line Clamps Aid Apparatus Inspection

The accompanying diagram of a hypothetical substation illustrates the manner in which hot-line clamps are used in substation design by engineers of the Commonwealth & Southern Corporation, Jackson, Mich., to permit disconnect switches, repeater fuses, lightning arresters and other types of low-maintenance equipment to be removed from service for periodic inspection without interruption of service.

Most substation designs assume there will be no maintenance necessary on auxiliary devices, and so no facilities are provided for rendering them "dead" for such operation. Experience, however, has proved the desirability of providing means for inspecting such devices periodically.

By arranging hot-line clamps as shown it is possible to kill the whole top of the structure, illustrated for inspection of the disconnect switches, or to remove leads to the repeater fuses and take them out of service also, without prejudice to service continuity.



HOT-LINE CLAMPS permit low-maintenance equipment to be killed for periodic inspection

DATA AND INSTRUCTIONS ON USE OF

GALVANIZED IRON WIRE

AS LINE CONDUCTOR MATERIAL*

VOLTAGE DROP IN IRON WIRE

PER CENT VOLTAGE DROP PER 1000 FT. OF CIRCUIT

GRADE BB-BARE-DOUBLE GALVANIZED IRON WIRE (B.W.G.)

K.V.A. LOAD	2400 V. SINGLE PHASE				4160 V. SINGLE PHASE				4160 V. THREE PHASE				12000 V. SINGLE PHASE				12000 V. THREE PHASE			
	1/4 *	# 6	# 8	# 9	1/4 *	# 6	# 8	# 9	1/4 *	# 6	# 8	# 9	1/4 *	# 6	# 8	# 9	1/4 *	# 6	# 8	# 9
20	1.41	3.25	3.90	4.83	.43	1.07	1.08	1.59	.21		.416	.645	These sizes not to be used, as # 8 & 9 will be satisfactory except where strength requirements must be met.		.15	.26	Voltage Drop Negligible			
30	2.24	4.65	6.00	6.75	.67	1.63	1.90	2.45	.33	.87	.75	1.15			.22	.34			.09	.13
40	3.25	6.00	7.66	8.33	.96	2.11	2.68	3.17	.46	1.12	1.19	1.62			.30	.46			.13	.18
50	4.4	7.3	9.10	9.8	1.25	2.60	3.32	3.75	.58	1.37	1.56	2.02			.40	.58		.16	.16	.24
60	5.4	8.5	10.3		1.58	3.08	3.93	4.32	.71	1.63	1.94	2.41			.50	.68		.19	.19	.31
70	6.3				1.97	3.46	4.48	4.85	.83	1.83	2.34	2.75			.60	.78	.102	.23	.23	.36
80	7.25				2.30	3.90		5.33	1.0	2.12	2.67	3.06					.115	.28	.28	.41
90					2.60	4.32			1.17	2.34	3.0	3.64					.13	.32	.32	.50
100									1.33	2.54							.18	.42	.45	.61
125									1.75								.20	.50	.56	.73
150																	.25	.56	.68	.84
175																	.30	.64	.8	.95
200																	.38	.78	1.0	1.13
250																	.48	.91	1.17	1.30
300																	.55	1.06	1.35	
350																	.71	1.2		
400																				

VOLTS DROP IN IRON WIRE SECONDARIES * *

(Not percent)

LINE AMPS	120 VOLT 2-WIRE SINGLE PHASE: VOLTS DROP PER 100 FT. OF CIRCUIT (120V-2W) # 6 BB	# 8 BB	# 9 BB	LOAD (K.V.A.)	120/240 VOLT 3-WIRE BALANCED SINGLE PHASE LOADS: VOLTS DROP PER 100 FT. OF CIRCUIT (240V-2W) # 6 BB	# 8 BB	# 9 BB	LOAD (K.V.A.)
5	4.12	4.6	6.97	.6	4.12	4.6	6.97	1.2
10	8.94	11.6	13.7	1.2	8.94	11.6	13.70	2.4
15	13.90	16.8	18.3	1.8	13.90	16.8	18.3	3.6
20	16.80	21.2	23.7	2.4	16.80	21.2	23.7	4.8

* * The large voltage drops preclude the use of iron for low voltages.

* 1/4" Common guy strand, 7 wire galvanized.

This data supersedes all previous issues on this subject.
The above values of voltage drop are approximate as iron wire varies widely in its electrical characteristics.
Values based on Bureau of Tests data, May 1942.
The percent drops do not include the reactance between the circuit conductors, which in relation to the drop in the wires for the loads given, are negligible.
The losses in iron wire are quite high.
The approximate (I^2R) Watts loss per 1000 ft. of circuit can be computed by multiplying the % drop by the K.V.A. load.
Example; 250 K.V.A. - 12000 V. - 3 ϕ #6 wire 250000 x .78 % = 1950 Watts for 1000 ft. of circuit.
The loss may justify using larger size wire than the % voltage drop would require.

WIRE SIZES TO BE USED

Light-Loading Areas—These areas are defined as being not subject to snow or ice loading, usually below the 3,000-ft. elevation.

For voltages of 7,500 and over, where the conductor will be on poles used jointly with a telephone company, the minimum size shall be No. 8. Where a line of such voltage crosses a major Class C telephone circuit, such as a telephone cable or more than two pairs of open wire, the minimum size shall be No. 8.

All circuits, irrespective of voltage, where crossing over a major railroad shall be a minimum of No. 8.

In rural areas, where joint poles are not involved, and except at major Class C telephone or railroad crossings, the minimum size shall be No. 9 for all voltages up to 17 kv.

For voltages of 17 kv. and above the minimum size shall be 1/4-in. galvanized strand in all crossings.

For circuits of 4 kv. and less, which are either on joint poles or over Class C telephone lines, the minimum size shall be No. 9.

Where No. 8 is used the spans shall not exceed 300 ft. and for No. 9 they shall not exceed 265 ft.

Heavy Loading Areas—In areas subject to ice and snow loadings the minimum size shall be 1/4-in. galvanized strand for all voltages.

Sags—Iron wire shall be "sagged" the same as copper conductors. The practice of this company is to sag all distribution conductors to same value irrespective of size, the working tension under maximum loading conditions being approximately 40 percent of the ultimate strength of wire.

*Based on instructions prepared by a Western utility

Simmer Unit Tests Meter for Rotation

By MERRITT A. GILES
Ohio Public Service Company, Mansfield

When setting a kilowatt-hour meter on a customer's premises, it has long been considered good practice by many operating companies to place a load on the meter. This is merely to make certain that nothing has happened to the meter since it was tested to interfere with its operation.

A newly set meter which does not register simply means a costly investigation when this fact is suspected after a couple of regular meter readings. Estimated bills are an unsatisfactory expedient, probably resulting often in loss of revenue and in loss of confidence by the customer on the dependability of the electric meter.

With the advent of the outdoor meter, the readily accessible cellar light vanished as a means of applying the test load, with the result that the frequency of setting inoperative meters increased considerably. To put in the tool box of our meter installers a device to load a meter easily, the meter committee of the Ohio Public Service Company has stimulated the development of the device illustrated.

This is simply a hook and handle some 11 in. long, made of two sheets of micarta. A copper contact "A" is embedded in the crook of the hook, and another on the stem as shown at "B." Flat conductors lead to a standard 120-volt, 200-watt Chromalox simmer unit, "C."

To apply load, the outdoor meter is placed in position with lower contacts only partially inserted, thus leaving approximately ½ in. between the base plate of the meter and the socket rim. Into this space the hook is inserted and contact "A" hooked over one of the load blades of the meter. Contact "B" touches the rim of the socket, thus completing a 120-volt supply to the resistance element and causing the meter disk to rotate.

In the case of three-wire meters, the other half of the current coil may be checked by merely hooking contact "A" over the other blade. Heat generated during this operation has been no problem since the check is short and there is always ample time between installations for the heat to be dissipated.

Meter installers who have used this have found it an exceptionally handy tool. Unfortunately, it may be impossible to obtain heater units of this type at present. It may be possible to substitute other types, but to find one as compact and rugged will be difficult.

RANGE ELEMENT and two sheets of micarta constitute ready means to assure that a set meter will rotate

Contact A touches either live leg and contact B the grounded case of the detachable meter socket.

•

Lead Pipe Pothead and Cable Splices

By E. E. SCHMIDT
Operating Department, Central Illinois Public Service Company, Springfield

Failure at a three-conductor pothead terminal resulted in the destruction of the pothead and several feet of a three-conductor type "H," No. 4/0 lead-covered cable. The cable being several hundred feet long with an O.D. of 2.2 in. presented a major problem of obtaining and installing an entire new length. As the cable was the back-up power supply for a 25,000-kw. unit at a generating station the situation required rapid repair, with insulation and capacity equal to the original cable. The working voltage was 13.2 kv.

The cable was cut at the damaged section 36 in. below the damaged pothead and the lead stripped 18 in. The three individual conductors were cut so that the joints would be staggered 5 in. apart and the shielding tape unwound and taped back on the cable for working clearance.

Three single-conductor potheads were obtained and mounted and a 72-in. length of the three-conductor cable was stripped of the lead, leaving three single conductors of the same rating as the original cable. Being No. 4/0 cable with $\frac{25}{64}$-in. paper with shielding tape the O.D. was approximately 1.1 in.

Three lengths of 1¼-in. lead pipe were purchased locally and slipped over the individual conductor reaching from the splice to the potheads. The usual splice was made with solder sleeves and the cable insulation properly stepped and sealed with oil stop, taped and covered with shielding tape. A 4-in. sleeve, 22 in. long, was beaten in and the joint was wiped, as was the lead pipe, with the conductors inside, to the pothead.

A ¾-in. female reducing bushing was installed and wiped in the 4-in. sleeve 2 in. from the bottom of the sleeve. The sleeve being in a vertical position, a ¾-in. filling tube was installed with the funnel the usual 12 in. above the pothead.

Compound was then poured and the liquid compound appeared in the base of the potheads, leaving the entire assembly completely filled without void or the usual sealing problems of the joint after the compound was poured, as the three openings in the lead pipe properly vented the joint and then filled to their terminals. After cooling, the filling pipe was removed and the ¾-in. threaded bushing hole was closed with a pipe plug and sealing compound.

Megger readings taken after the cable was repaired and ready for service were identical with those taken after the damaged section was cut away, 250 megohms to ground.

•

More Steam—How?

13. Spare Parts*

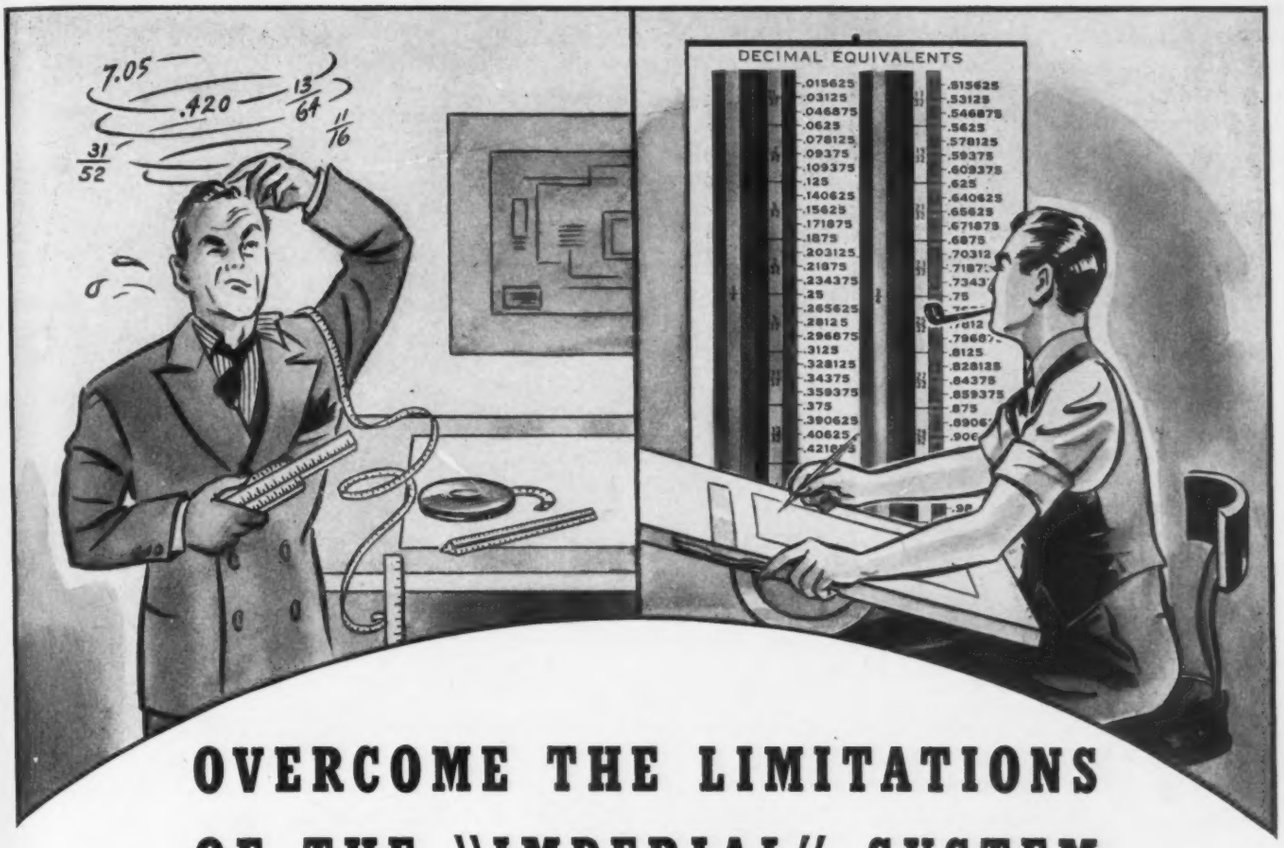
By ALFRED IDDLES
Application Engineer
The Babcock & Wilcox Company

Undoubtedly, if the operator has his way, he has an ample supply of spare parts, and really I have only two or three points to make in this connection, none of which I hope are apropos to this audience. One is that it is very embarrassing to take a boiler off the line for the first time and find that the original gaskets need replacement and discover that none are on hand.

I suppose we have all learned that

* This series began in the May 16, 1942, issue of "Electrical World," adapted from author's talk "What the Operator Wants to Know" to Steam Power Division, A.S.M.E., Metropolitan Section, March 25, 1942.

How do YOU *do it?*



OVERCOME THE LIMITATIONS OF THE "IMPERIAL" SYSTEM

- The "IMPERIAL" is the customary system of measurement used in the British Empire and in the U. S. A.

  From the beginning of time, man has striven to unify and simplify his measurements.

- The "CUBIT" . . . oldest known measure of length, varied, but averaged 21.8" . . . Egypt had 3 different cubits, 17" for the common man, 21" for the King, and 35" for the Sanctuary.

- The "FOOT" . . . originated in Greece . . . became the standard unit of length in the early Olympic Games . . . reputed to be the length of Hercules' foot. Romans based their system upon the Greek method, and forced their Romanized code of measurement upon England. When Britain was again free, this Roman-Greek system was modified . . . and thus started the "IMPERIAL" system.

- The "YARD" . . . originally the circumference of a man's body, later the length of the first King Henry's arm . . . still later became a multiple of the foot.

- The "INCH" . . . the length of 3 barley corns . . . later became 1/12th of a foot.

- THE LIMITATIONS ARE THAT THESE UNITS ARE NOT MULTIPLES OR UNITS OF DECIMALS.

  Modern Engineering and Manufacturing demand flexible and precise standards . . . hence the use of Decimal Equivalents.

  Time will not permit individual interpolations.

- The CONTINENTAL-DIAMOND Decimal Equivalent Chart is an indispensable aid to crash through the limitations of the "IMPERIAL" system . . . in colors . . . 23" x 35" . . . easily read . . . gives Decimal Equivalents from 1/64th" to 64/64"

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high-pressure boilers have more trouble with gage glasses than lower pressure ones and I am afraid some of us have discovered that the quality of available glass is worse than it was a few years ago, which adds to our troubles. Spare glasses are of course essential. I know of a number of instances, however, where glass breakage has been markedly decreased by shadowing the glasses to prevent drafts and by special training of mechanics for their reinstallation. Most flat glasses involve installation technique which is frequently not available in the ordinary mechanic, and many plants have found it desirable to train two or three men and depend upon them always to make the glass change. The feel of the situation seems to be a part of the art.

Seating Handhole Plates

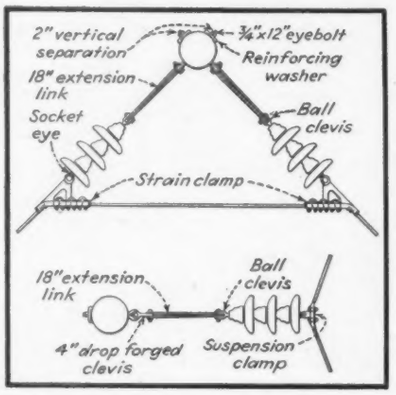
I sometimes pray for an old-fashioned mechanic who knows how to reseat a handhole plate or header seat. Sometimes I wish the erectors were not so carefree about the quality of such seats. My suggestion is that many plants can afford to have a reseating machine, so that, when necessary, a real job of reseating can be done. It will save many a wasted hour in bringing a boiler on the line and frequently prevent unscheduled outages. Of course most of us are eliminating handholes wherever possible, especially in superheaters and economizer headers, but it does not yet seem wise to eliminate handholes in water wall headers because of need for inspection and possible cleaning. These handhole fittings must be properly maintained or trouble will result.

The best spare part that an operator can have is a qualified welder. If he has this and an assortment of tube sizes and lengths, he can take care of all of the pressure parts of a modern boiler and save time and money. Of course there are some units in which simple relatively straight tubes may be stocked for replacement or where perhaps a superheater loop might be profitable in the storeroom, but, by and large, repairs due to common difficulties, such as a bad section of tube or a soot blower cut or a spot that has been mechanically damaged, can be more easily and quickly made by welding in a section. This applies also to water wall tubes and economizer tubes.

How to Turn Angles on 25 and 33-Kv. Lines

Ball and socket type insulators, an 18-in. extension link and a conductor clamp comprise the principal parts for single- and double-string angles on the 22-25-kv. and 33-kv. lines of the West Penn System.

Three porcelain suspension insulators, each of 15,000-lb. strength rating, are used unless otherwise specified on the line plan. Four units per string are used on the 33-kv. lines. Other suspension type insulators which may be used are porcelain



SINGLE-STRING (top) and double-string angles for 25- and 33-kv. lines

with 25,000-lb. strength rating and Pyrex with 18,000-lb. strength rating.

A distance of not less than 4 ft. is required for vertical separation between line wires. As a rule, angle poles are to be graded 5 ft. higher and adjacent poles 2½ ft. higher than normal. At angles less than 30 deg. corners are turned on crossarms.

•

Compressibility of Composition Cork—I

By L. P. HART, Jr.
Works Laboratory, General Electric Company, Pittsfield, Mass.

Because of its better resistance to moisture resinous-bonded rather than protein-bonded composition cork is often used as gasket material on liquid-filled electrical equipment. Compression characteristics are essential for properly forming a seal. For inspection purposes the characteristics may be used for control of quality; however, density measurements on from two to fourteen samples, depending on uniformity of each incoming shipment, have been found to be a more rapid method of control.

So-called "dynamic" compressibility is needed (1) properly to design the bolting structure which will provide a certain degree of compression and (2) to make available the load in pounds per square inch for an amount of compression which will result in optimum density. Dynamic and "static" compressibility are related.

Static compressibility is obtained by test of the samples. It is the compression, expressed as percent of the original thickness, which the sample undergoes under a pressure of 300 lb. per square inch for one minute.

Dynamic compressibility is the pressure in pounds per square inch necessary to compress the cork to half of its original thickness. This value can be determined from the formula:

$$D = \frac{(1.888 - \log_{10} S) \times 10^4}{5.34} \qquad (1)$$

where D is dynamic compressibility and S is static compressibility.

Values determined by tests for S and by formula (1) for D are without regard to age, source, density of material or the relative humidity to which the material has been subjected.

To reach a predetermined gasket thickness in assembly work compression of the composition cork gaskets may be in one continuous operation of tightening the bolts, instead of in two or three steps as has been thought necessary. Splitting of the gaskets results from compression by surfaces not in the same plane, caused by an improperly designed structure or by non-uniformity of bolt tightening as in the case of large gaskets.

A composition cork gasket takes a permanent set after it has been under compression for a period of time. It has been found that the percent return to original thickness is very small and that the percent set approaches the percent compression.

When gasketed surfaces move apart from each other, as when a transformer breathes, the strength of the seal, which depends on pressure, is weakened. If an adhesive is used to fasten the cork and the surfaces, the seal will be retained during movement of the surfaces.

How compressibility characteristics can be determined by density measurements and how they are affected by changes in relative humidity will be presented in a subsequent article.

Use a Cable that Does the Job

WITHOUT

WASTING COPPER

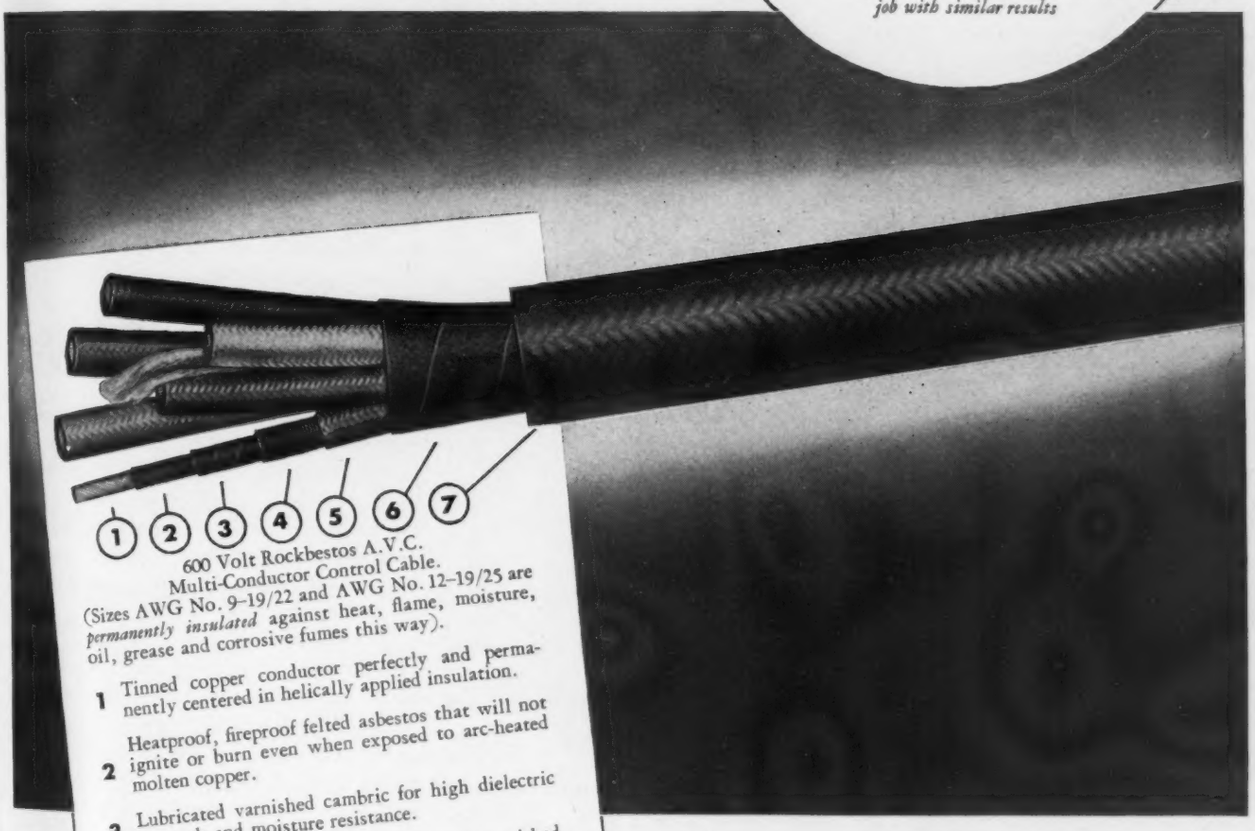
You can save copper *when you order* wire and cable; *pounds*, perhaps *hundreds of pounds*, probably as much as *a ton or more*, —you can help spread our rapidly diminishing copper supply farther—and you can do it by specifying smaller conductors that will still be adequate for normal operating requirements.

To the right is but one example of what can and should be done more often to further copper conservation.

3806 LBS. OF COPPER SAVED ON A SINGLE JOB

A large mill had habitually bought Rockbestos A.V.C. Multi-Conductor Control Cable in size #9 AWG—19/22 strand conductors. They had a requirement for 16,000 ft. of 12 conductor cable. Our engineer asked, "Do you actually have to use a #9 conductor? Wouldn't #12—19/25 strand conductors amply carry your control circuit?" Customer investigated, decided he could make the change—result: a saving of 3806 pounds of copper while still having ample current carrying capacity.

Our engineers may be able to analyze your job with similar results



600 Volt Rockbestos A.V.C. Multi-Conductor Control Cable.
(Sizes AWG No. 9–19/22 and AWG No. 12–19/25 are *permanently insulated* against heat, flame, moisture, oil, grease and corrosive fumes this way).

1. Tinned copper conductor perfectly and permanently centered in helically applied insulation.
2. Heatproof, fireproof felted asbestos that will not ignite or burn even when exposed to arc-heated molten copper.
3. Lubricated varnished cambric for high dielectric strength and moisture resistance.
4. Another felted asbestos wall to seal the varnished cambric away from heat, flame and oxidation.
5. Color-coded cotton braid for easy circuit identification.
6. A wrapping of moisture-proof tape to bind the cabled conductors and jute filler together.
7. A tough, rugged asbestos braid impregnated with inert compounds that are resistant to heat, flame, moisture, oil, grease and corrosive fumes.

Copper can be saved safely on many jobs with Rockbestos A.V.C. (asbestos and varnished cambric insulated) Underwriters' Type AVA, and Rockbestos All-Asbestos, Underwriters' Type A1, wires and cables. Their heatproof, fireproof insulation in many instances gives you greater carrying capacity because it can be run hotter (Type AVA, 110°C.–230°F., Type A1, 125°–257°F., N.E.C. page 286). These constructions are resistant to heat and moisture, oil, grease, flame and corrosive fumes, will not bake brittle, bloom, burn or rot. For recommendations on your specific cases and samples write to Rockbestos Products Corporation, 870 Nicoll Street, New Haven, Connecticut.

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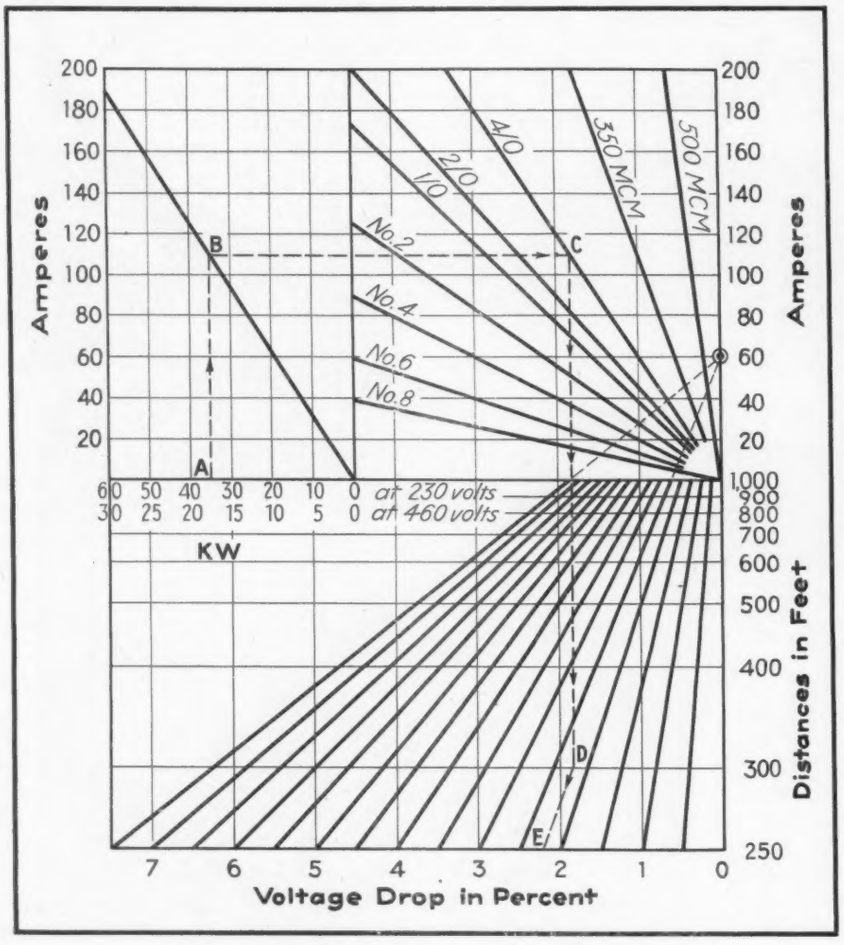
HOW TO DETERMINE

Three-Phase Secondary Drop Copper and ACSR

By F. C. RAND
District Manager, Gulf Public Service Company, Jackonsville, Tex.



VOLTAGE DROP CHARTS

For 230- and 460-volt, three-phase circuits

Assume 80 percent power factor load, 6-inch conductor spacing

Instructions for Use of Charts

1. Choose the kw. load (at the voltage involved) at (A) on base line of upper left rectangle.

2. Follow vertical line upward to intersection B of diagonal line and read amperes on ampere scale at left.

3. Follow horizontal line to right to intersection C of diagonal line for respective wire size.

4. Follow vertical line downward to horizontal line denoting distance, as at (D).

5. Follow diagonally to base line of chart and read percent voltage drop, as at (E).

If load in amperes instead of kw. is known, then amperes may be read directly in the left margin, and the procedure is similar to the above.

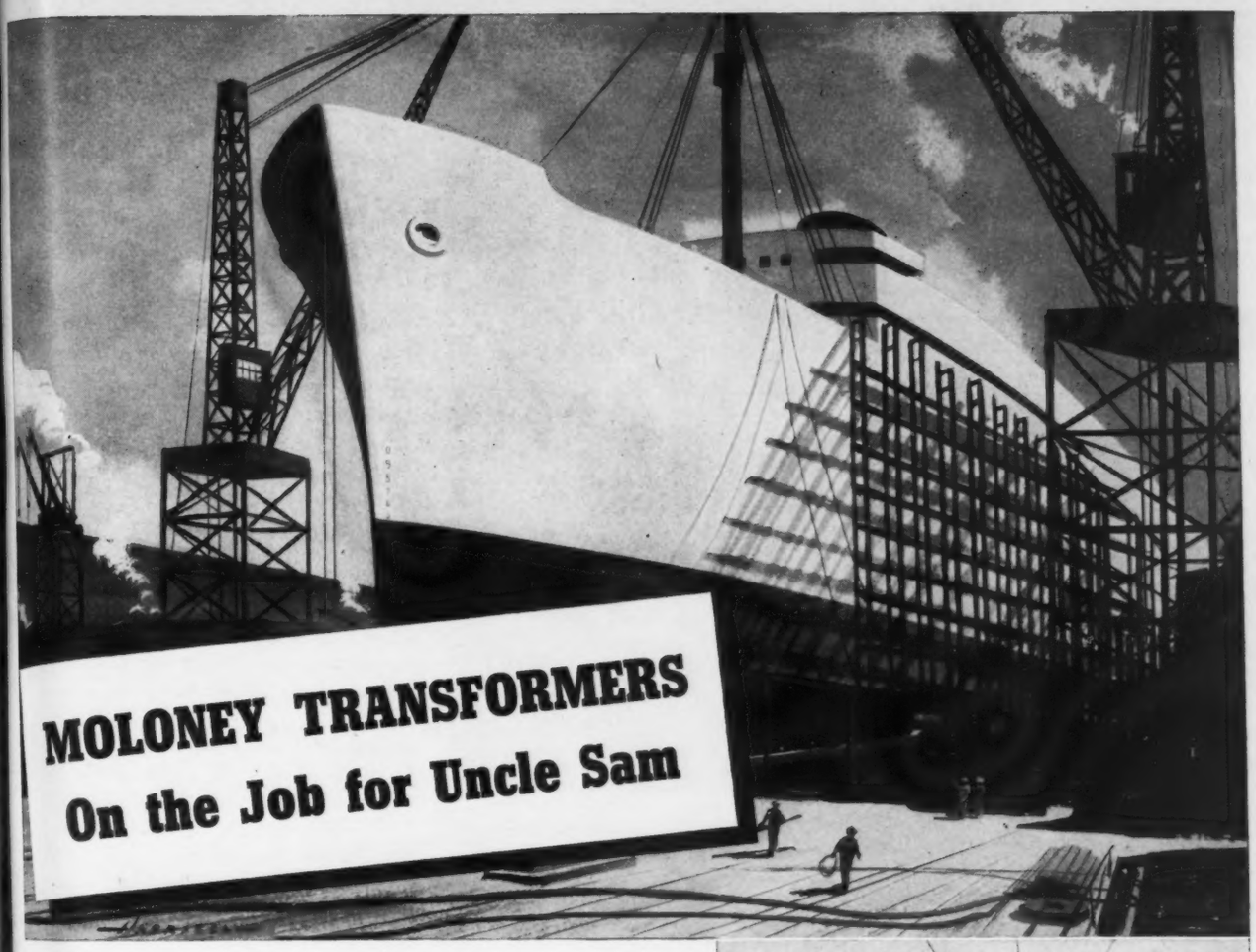
The problem may be reversed, starting with an assumed voltage drop (at a given voltage) and working back to determine amperes, wire size, maximum load, or distance.

In case the load is greater than the maximum on the base line of the rectangle, then a convenient fraction of the load, such as $1/2$ or $1/4$, may be substituted, and the resulting voltage drop will be inversely increased, such as doubled or quadrupled, as read on the chart.

In case the distance is less (or greater) than the minimum (or maximum) on the margin of the chart, a multiple (or fraction), such as double or triple (or $1/2$ or $1/3$) may be substituted, in which case the resulting voltage drop will be inversely decreased such as $1/2$ or $1/3$ (or increased, doubled or tripled), as read on the chart.

Note—Parenthetical inserts in this paragraph are for distances greater than maximum shown on chart.

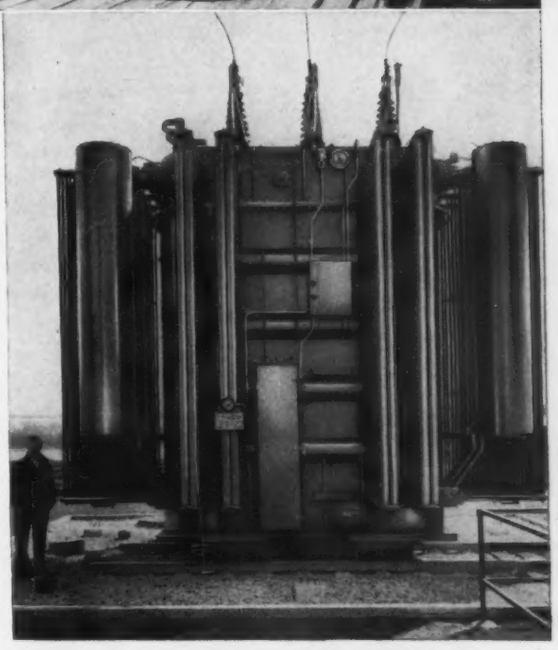
The above charts are for copper wire. In case ACSR conductor is desired, approximate results may be obtained by substituting for the copper wire on the chart ACSR conductor two sizes larger; for example, substituting the copper equivalent of No. 4 ACSR or No. 6 copper wire on the chart.



MOLONEY TRANSFORMERS
On the Job for Uncle Sam

ELECTRIC POWER is enabling mass production methods to turn out Navy and Merchant Marine ships in record time. Moloney Transformers are doing their bit in the shipyards of the nation by converting electric power to voltages required by welding equipment, cranes, and the many other industrial tools used to change steel plates into ships. They are also helping electric utilities in their job of supplying power to the shipyards.

Moloney Transformers can help you do your war job, too, if you require transformers that can be depended upon under all operating conditions.



A 25,000 Kva, 69,000 Y to 13,800 volt three-phase transformer equipped with inert gas protection.

MOLONEY ELECTRIC COMPANY • ST. LOUIS, U. S. A.

TRANSFORMERS EXCLUSIVELY SINCE 1896

Electric Heater Sets Turbine Bolts Tight

By E. F. MILLER
Section Engineer, Mechanical Section, Westinghouse Electric & Manufacturing Company, South Philadelphia Works

Bending and torsional stresses in turbine-casing bolts should be reduced to a minimum. These are particularly bad for high temperature bolting where ductility and shock resistance may have been sacrificed in some degree for desirable creep or relaxation properties.

But, in addition to proper heat treatment of a bolt of proper material, there is the opportunity to use heat in conjunction with the tightening of the nut to avoid the undesirable bending, torsional and shock strains that arise from wrench and hammer methods of tightening. Preheating in a furnace, by torch or by external resistors, necessitates haste in placing and tightening the bolts and results in unpredictable stresses.

A much preferable procedure is based on internal heating of the bolt which involves provision of a hole through it to accommodate the means of heating. Experience has shown the electrical heater more precise and dependable than hot air, torch flame or superheated steam. But even in applying electric heat it is important to have high output for quick application of the heat to the bolt with minimum heating of flanges and surrounding parts. Rods of carbon or resistance alloys served by heavy-current, low-voltage transformers have been used with good success, but burning of the bolt often results.

A new procedure employs a slender cylindrical heater of high output for operation on standard voltages, having a helically wound resistance element that interposes no thermal insulation between it and the inner wall of the bolt. The coil is wound in a deep helical groove in a tubular ceramic core. Flat-topped lands between the grooves prevent short-circuiting of turns by contact with the bolt. The heaters are designed for use in hole sizes of one-fourth the nominal bolt diameter and are available in outputs of 0.9 to 18 kw. to function with 1½ to 6-in. bolts, in the latter size up to 5-ft. length.

Satisfactory heating rate is obtained with a capacity of 50 watts per inch of bolt diameter per inch of length. With such input the heating is completed in about five minutes for each inch of diameter. Thus a 3-in. bolt requires about fifteen minutes, the variations depending on the amount of tightening desired and the physical proportions of the flange.

Micrometer measurements of the bolt length (hole bottom to nut end) before heating and after cooling provide a basis for determining whether the stress under the set-up condition conforms to the desired value.

TUBULAR HEATER inserted in hollow bolt expands it for proper stressing when tightened

Mono-Sodium Phosphate for Silica Scale

Water in the Portland, Ore., city water system, which comes from the melting glaciers of Mt. Hood, contains one element, silica, in proportions as high as 4.8 parts in a million. It forms an exceedingly hard scale in boiler tubes.

Northwestern Electric Company of that city has, in recent months, been giving careful study to water treatment. The plan adopted is in accord with the recommendations of F. R. McLean, chief of laboratories, Pennsylvania Power & Light Company, that mono-sodium phosphate be employed as the reagent. To keep the pH value above 9.5 and not to exceed 11, a small amount of tri-sodium phosphate is also used. The aim is so to regulate as to get an excess of phosphate of about 40 parts in one million.

This work was started about March 1, 1942, along with a vigorous campaign of tube turbining completed July 1. The process has proved effective. Before the turbining began on some of the boilers much scale was knocked down by the treatment and could be blown off. Due to the treatment, turbining time was cut down about one-half on the last boiler. Between the two activities every tube is now clean.

The mono-sodium phosphate and tri-sodium phosphate are injected into each individual boiler. A Taylor pH and free phosphate "Comparator" is used, while the measure of grains per gallon of salts in solution is determined by a Walker "Densimeter."

• • •

Cost Data from a Plant Guarding Job

Barbed Wire Entanglement (Requiring 800 ft. Wire)

Screw bars for barbed wire	$10.50
Eight 100-ft. coils barbed wire	8.80
Furnish and erect 24-wire entanglement with a 12-ft. gate, about 10 ft. from existing fencing	850.64
Miscellaneous items	66.20
Stock	3.63
Overhead and equipment charge	9.30
Labor	86.93
Total	$1,036.05

Installation of Three New Gates in Wire Fence

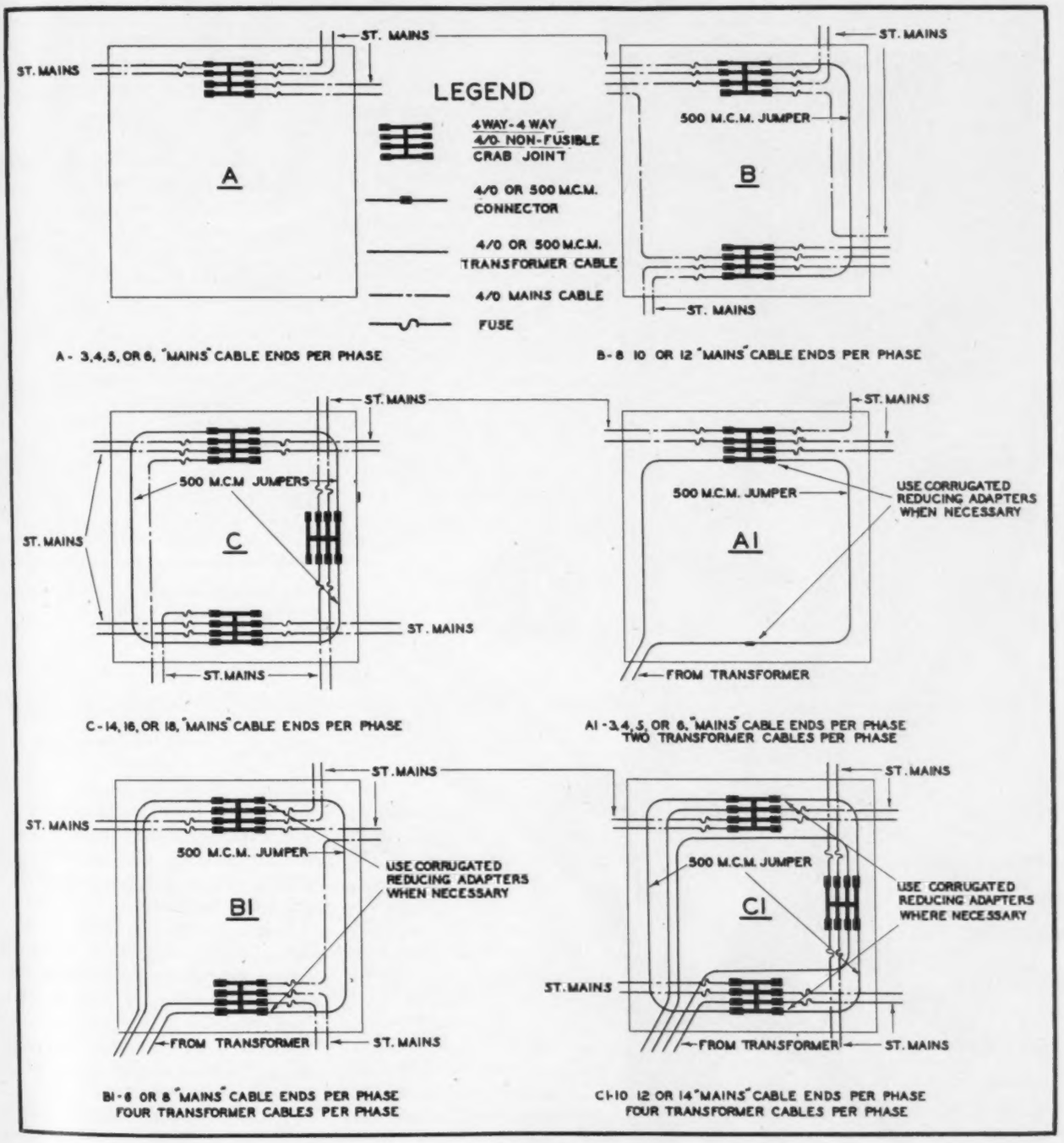
Two 8-ft. and one 4-ft. gates, 2-in. mesh, No. 6 Page Armco ingot wire fencing, arranged for locking	$195.60
Labor	41.00
Overhead and equipment charge	16.62
Total	$253.22

Locking up Main Steam Plant

Installation of 21-ft. Page Armco ingot wire fence, 9-ft. high with 1-ft. barbed wire at top, 2-in. mesh, No. 6 galvanized wire and two 8-ft. gates, 16 x 10 ft.	$72.76
Raise existing 8-ft. gate and 106-ft. existing chain link fence 4 ft. around transformer inclosure	224.18
Electric door opener and fittings	28.88
3 Handset telephones	38.81
1 Mortise lock, ash sump room	25.00
40 ft. of ¾-in. conduit pipe	6.82
One turbine room door grille, 15 x 10 ft.	78.00
Boiler house, protecting 15 windows, four doors	441.00
Labor	204.47
Miscellaneous	110.66
Overhead and equipment charge	45.67
Total	$1,276.25

HOW TO MAKE
MAINS CABLE CONNECTIONS WITH NON-FUSIBLE CRAB JOINTS

When transformer cables are to be connected refer to sketches A_1, B_1 and C_1


ST. MAINS
LEGEND
4 WAY - 4 WAY 4/0 NON-FUSIBLE CRAB JOINT
4/0 OR 500 M.C.M. CONNECTOR
4/0 OR 500 M.C.M. TRANSFORMER CABLE
4/0 MAINS CABLE
FUSE
A
B
500 M.C.M. JUMPER
A - 3, 4, 5, OR 6, "MAINS" CABLE ENDS PER PHASE
B - 8 10 OR 12 "MAINS" CABLE ENDS PER PHASE
C
500 M.C.M. JUMPERS
C - 14, 16, OR 18, "MAINS" CABLE ENDS PER PHASE
A1
USE CORRUGATED REDUCING ADAPTERS WHEN NECESSARY
FROM TRANSFORMER
A1 - 3, 4, 5, OR 6, "MAINS" CABLE ENDS PER PHASE TWO TRANSFORMER CABLES PER PHASE
B1
B1 - 6 OR 8 "MAINS" CABLE ENDS PER PHASE FOUR TRANSFORMER CABLES PER PHASE
C1
USE CORRUGATED REDUCING ADAPTERS WHERE NECESSARY
C1 - 10 12 OR 14 "MAINS" CABLE ENDS PER PHASE FOUR TRANSFORMER CABLES PER PHASE

NOTES

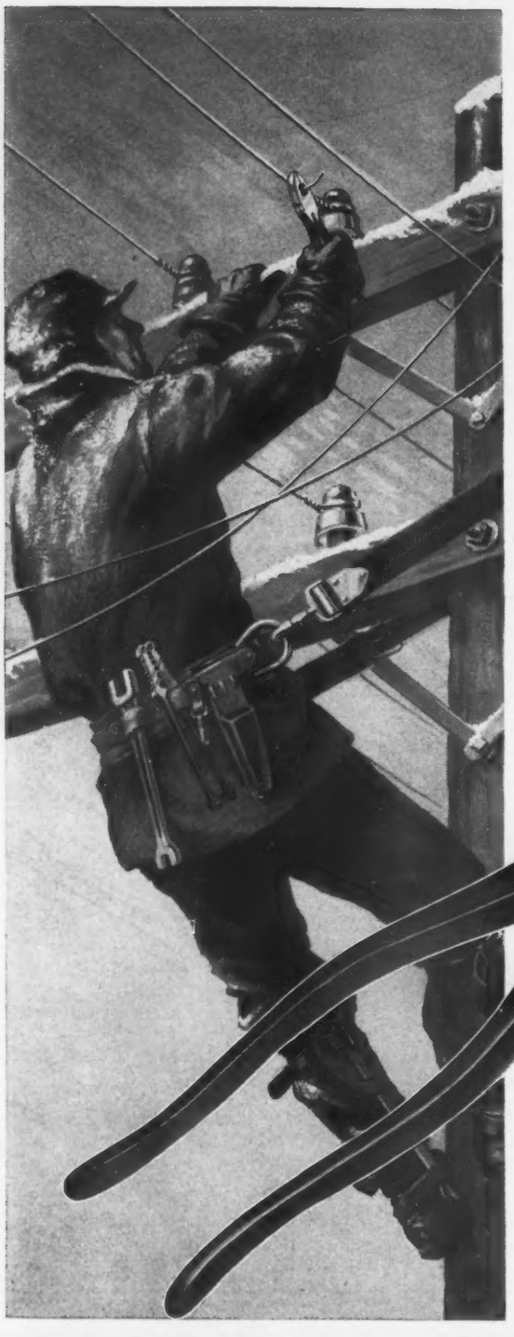
1. These drawings are schematic only.
Locations of splices depends on racking conditions in each case.

2. One phase only is shown.

3. Single-phase loads should be balanced on the three phases in each manhole.

*From Underground Distribution Standards of Western Massachusetts Companies

A STURDY TOOL FOR TOUGH JOBS —KLEINS!



War-time emergency means messages must go through. Power service cannot be interrupted either if vital war industries are to produce to capacity. There's no time to wait for skies to clear or the mercury to rise —no matter how tough the job. The man on the pole who keeps the lines open knows the tools he uses have to be tough, too. That's why you will find the Klein name on his pliers and wrenches, on his safety strap and belt. He knows it stands for equipment that he can rely on.

Your copy of the Klein Pocket Tool Guide will be sent on request

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Core Loss Correction Made by Voltmeter

For obtaining correct measurements of transformer core loss when the wave form of a commercial or test voltage differs from the standard sine wave, an instrument known as the "average-voltage voltmeter" has been designed. Such a voltmeter as the one constructed by F. K. Dalton, testing engineer, Hydro-Electric Power Commission of Ontario, has been used by him in numerous tests and investigations on transformers and has proved very valuable, as explained in *Electrical News and Engineering* (Canada) for July, 1942.

The portable instrument consists of three essential units (see diagram)—

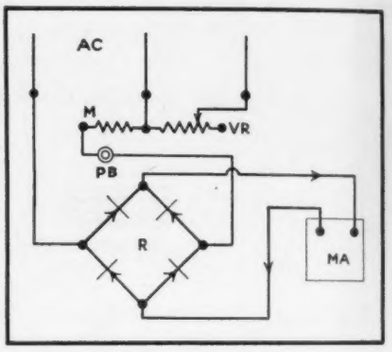
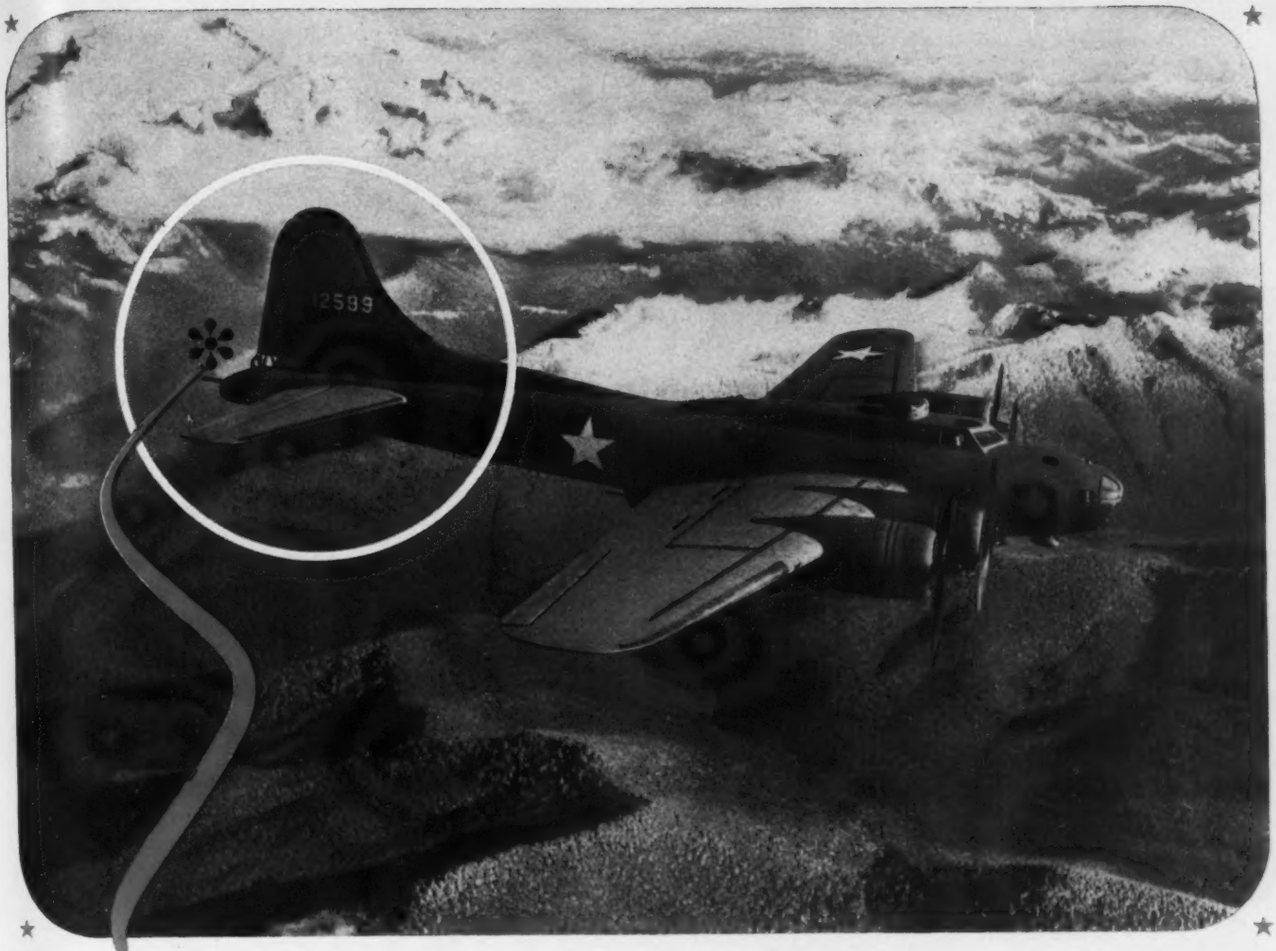


DIAGRAM of connections for an average-voltage voltmeter

a direct-current milliammeter, MA, with a linear scale of 150 divisions; a full-wave rectifier, R, of the copper oxide type, and a high-resistance multiplier, M. A push button, PB, is inserted to keep the circuit open for protection of the rectifier when the milliammeter is not connected. This voltmeter usually is adjusted to agree with an r.m.s. voltmeter on a pure sine wave, but the variable resistance, VR, is a special feature for calibration of the instrument on steady unidirectional voltage, rather than on the sine wave, which is convenient in certain tests.

This instrument rectifies the negative half cycles of voltage and indicates the arithmetical average value of the wave, which value is a direct measure of the area, provided that the wave does not pass through zero value more than twice per cycle. The ratio of r.m.s. to average value is known as the "form factor" of the wave, and this factor indicates in some special cases the presence of harmonics and



How does a Bomber Pilot

COMMAND TONS OF PRESSURE WITH POUNDS OF EFFORT?

YOU'VE seen a heavy bomber change direction in the air—climb, bank or nose down. It looks easy, although the airstream is actually piling tons of pressure against the rudder and tail surfaces.

It even looks easy in the cabin, as you watch the pilot handle his controls. And it is easy, because a little trick called an "amplidyne"—which steps up electrical power input to the control motors about 10,000 times—is doing the work for him.

This mechanism, a development of one of the nation's largest electrical manufacturers, depends upon the special properties of an Allegheny Ludlum Electrical Steel to achieve its results. Into the steel, as it must be in the amplidyne itself, is built reliability, uniformity and stamina.

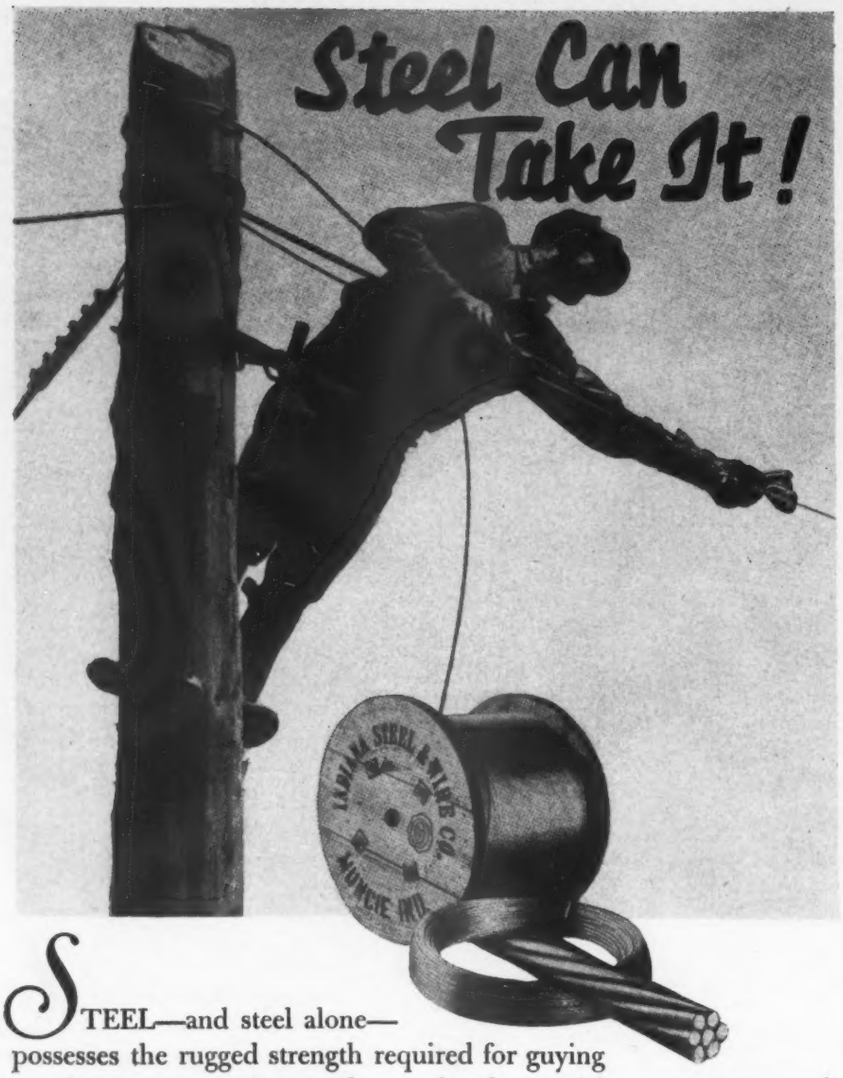
Although important, this is only one of the dozens of wartime electrical devices to which Allegheny Ludlum Electrical Alloys have lent desirable qualities of magnetism, high permeability, or high resistance. The list covers control, detection and communications equipment for all the services.

For engineers and production men desiring certified technical information on these special alloys, write for a copy of the *"Electrical Materials Blue Sheet."* If you need assistance on fabricating problems, our Technical Staff is at your service.

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

Steel-Makers to the Electrical Industry

A-8689 . . . W & D



STEEL—and steel alone—possesses the rugged strength required for guying a pole structure... For steel can take the punishment encountered both in construction and in service.

All the strength and ruggedness inherent in steel is developed to the fullest extent in *Crapo* Galvanized Steel Strand. Each size and grade is manufactured from steel of selected analysis and processed from start to finish to do the job for which it is intended.

The heavy, ductile, tightly-bonded zinc coating—applied by the famous *Crapo* Galvanizing Process—provides lasting protection against corrosion; extends the life of the strand beyond the normal period of replacement.

There is a size and grade of *Crapo* Galvanized Steel Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write for further information!

INDIANA STEEL & WIRE COMPANY..... MUNCIE, INDIANA

Crapo GALVANIZED STEEL STRAND

whether the wave is peaked or has a flattened top.

This voltmeter is particularly useful in determining the correct core loss of transformers for the hysteresis loss is directly proportional to the average value of the applied voltage wave, without regard to wave form, and the eddy loss is corrected to sine wave values in proportion to the square of the ratio of average to r.m.s. value, the combined correction formula being quite simple. A refinement, therefore, in the measurement of core loss may be obtained by the use of the average-voltage voltmeter.

Other applications of the instrument are the determination of true exciting current of transformers and analyzing magnetic networks.

In "Test Code for Transformers" the American Standards Association recommends the use of the average-voltage voltmeter for correcting inaccuracies in measurements of core loss and exciting currents when the supply voltage is not of the standard wave form. A knowledge of the proper use of the instrument is therefore very desirable.

•

Maintenance of Insulating Oil

II. Oxidation, Moisture *

By L. M. LIMPUS

Superintendent of Reclamation
Oklahoma Gas & Electric Company

Many oils may be refined to the standard specification and yet show considerable weakness toward resistance to oxidation when placed in service. This is due principally to the fact that, to date, no suitable "life test" has been developed which will satisfactorily indicate the exact behavior of an insulating oil in actual service. However, a good oil, obtained from a reputable manufacturer, may be used in most cases as a universal oil to good advantage, but the promiscuous mixing of different oils may lead to serious trouble by completely ruining the stability of a new and otherwise highly stable oil.

Insulating oils furnish approximately one-half of the apparatus insulation and are indispensable as a cooling medium for oil-filled trans-

*This series began in the October 17 issue of "Electrical World."

The why of better turbine lubrication with

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It's Alchlor Processed!

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We suggest that you ask the Gulf engineer in your vicinity to give you complete details about this quality lubricating oil. Or send the coupon below for the brochure "Gulfcrest Oil" — no obligation, of course.

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ELECTRICAL CONDUCTORS

are the Nerves of Planes...Ships... Tanks...

and CRESCENT INSULATED WIRE & CABLE CO. is doing its part in furnishing a vast quantity of electrical wires and cables that carry the power from battery or generator to delicate parts that control these instruments of destruction. Telephones, radios, lights, signals, starters and instrument control are all dependent on electrical conductors that *must not fail.*

CRESCENT has had over fifty years experience in the manufacture of ALL types of Electrical Wires and Cables.

100% War Production

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WIRE and CABLE
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CRESCENT ENDURITE SUPER • AGING INSULATION

formers and regulators. If permitted to deteriorate beyond certain limits, they will react as obscure weaknesses, leading both directly and indirectly to ultimate "burn-outs," which may erroneously be attributed to some other very evident, though secondary, cause. Deteriorated insulating oils are responsible for a much larger percentage of equipment failures than the average operating engineer recognizes as such. Many lighting, switching surge and short-time overload failures could be eliminated by adequate and effective maintenance of the insulating oil.

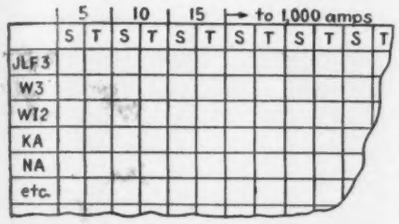
Moisture Contamination

Modern construction practices and improved maintenance methods have virtually eliminated moisture as a primary concern of the operating engineer and maintenance supervisor. Moisture contamination of solid fibrous insulation is now easily discovered by power-factor testing, and controlled by simple maintenance operations. If all the causes contributing to oil-insulated equipment failures are properly diagnosed it may be found that dust, fibers, acids, corrosion, carbon and sludge offer hazards far greater than the average moisture condition as experienced in the modern and modernized apparatus. Further, the hazard of these other contaminants has been materially increased during the past several years by the growing demand for more efficient loading of the older apparatus (which has resulted in higher operating temperatures), the overload demands of the present war emergency and the manufacturers' use of pressed steel tanks and untreated organic insulation in the more modern units. The old cast-iron tank was almost corrosion proof and the varnish-impregnated windings reduced the total amount of copper in intimate contact with the insulating liquid.

Standard tests which are in more or less general use today to denote oil deterioration and contamination are dielectric strength, power factor, oil color, total and water-soluble acidity, sludge formation, and steam emulsion number. Some of the other laboratory tests applied in the study of insulating oils are resistivity, ester value, viscosity, hydrophil number, saponification number, and percent resin.

Order of Instrument Transformer Testing

To maintain an adequate supply of instrument transformers of all types and sizes ready to fill each day's installation demands, testing work must be reasonably well coordinated with withdrawals from stock. Otherwise it might happen that no W5-200's are available today because the tester worked all day yesterday checking JLF-3's. To avoid such embarrassing



RECORD BOARD shows instrument transformer tester what to work on next in order to keep proper numbers of tested transformers on hand for installation
The segment here reproduced is a sample of the current transformer record; potential transformers, according to primary voltage ratings, are kept track of in the same way farther down on the board.

reflection on methods of work organization, a neatly ruled blackboard is hung on the wall in that corner of the meter laboratory of the Philadelphia Electric Company where current and potential transformers are tested.

As indicated in the accompanying sketch, the blackboard, about 4 ft. high and 5 ft. wide, is ruled in squares, the rows across designated by types of transformers and the columns in pairs of "S" and "T" topped by sizes in primary ratings. Figures in the "S" columns show how many of the particular size and type of transformer are in stock and the "T" columns how many of them are tested and ready for installation. The tester changes the figures in the "T" columns as his work moves along and thus is able to tell at a glance what to start on next when one group of tests is finished. Figures in the "S" columns are changed as stock accessions and withdrawals are made.

With knowledge, gained from experience, of the rates at which given types and sizes of transformers move into and out of the shop, the tester can tell pretty well how many of each should be ready for use. Thus he

Save CRITICAL WAR MATERIALS

Use PERMAFLECTOR Floodlights

Wherever you want LIGHT for production or protection, install PERMAFLECTORS – the Silvered-Glass Reflectors that pick up the Maximum Flux of Light and put it where you need it. New, Permaflector-equipped enclosed floodlights employ a minimum of critical war materials. Rugged, water-tight, weather and corrosion-resistant. Complete. Ready to set up. Available in four wattages and three light distributions – broad, intermediate, concentrated.

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For broad illumination or for high intensity illumination, properly-spaced, low wattage Permaflectors may be the answer to your lighting problem. Ready for service, require no metal housing, quickly, inexpensively surface-mounted or suspended. Minimum maintenance – the silvered-glass reflecting surface of Permaflectors will not darken, tarnish, or discolor, nor will the backing check or peel.

FOR AUXILIARY LIGHTING . . . .
To pick up the weak spots in your lighting, to provide extra light for quick, accurate, effortless seeing, install Permaflector auxiliaries. Over 70 designs – a correct shape for almost any and every purpose – to make light a more efficient production tool.

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Clip to letterhead. Sign. Mail for complete information, prices.

STURD-E GUARDED
PIKE POLE

• The automatic guard adds immeasurably to the safety of this pole—the point is covered when not in use—completely guarded against damage. When in use, the tubular sleeve slides back and reenforces the head, adding to the service life of the pole.

The spike is forged from best quality steel, heat treated and tempered for long life. Handles are select fir—sanded and lacquered—lengths regularly furnished ten to twenty feet. For maximum service life, economy, and value, specify

STURD E TOOLS
a TRUE TEMPER PRODUCT

Automatic Tubular Pike Pole guard is shown in the phantom view above. Extremely simple in operation, it gives positive protection to the point of the pike.

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plans his work to keep adequate supplies of tested transformers always on hand.

•

Inspection of Parts Reduces Replacements

Closer and more frequent inspection of parts that receive excessive wear and extensive use of the welding torch and metalizing machine are credited with saving thousands of dollars in the power plants of Indianapolis Power & Light Company during the present war emergency. These and other methods here outlined are expected to keep equipment in good operating condition despite scarcity of replacement parts.

Inspection has been found to pay dividends on such parts as powdered coal exhauster fan housings, coal pulverizer mill liners, wedge bars and trunnion parts, ash conveyor equipment wear elbows and conveyor pipe, induced-draft fan runners worn by fly ash and induced-draft fan housings. These parts can be built up as soon as they start to wear away, before they have reached the stage of complete deterioration.

Worn pump shafts are no longer thrown away, and those that once were discarded are being retrieved from the salvage pile. Shafts with a worn area are "metalized" and machined to proper diameter, making them almost as good as new.

An effort is made, by daily inspection, to detect small cuts that appear in conveyor belts so that they can be treated immediately rather than allowed to start rotting, and thus cost a large new section of belt.

Soot blower elements are checked more often than formerly to determine if the element is down or getting too close to tubes or superheaters. If signs of impingement from the soot blower appear on the tubes a welding build-up is ordered to stop further destruction or loss of the tube.

On hydraulic ash sluice systems the discharge pipes are rotated, top for bottom and side for side, more often than heretofore in order to equalize erosion and wear and thus realize the maximum service from them. Previously a pipe was changed occasionally from top to bottom, but it has been found that side-for-side changing also provides many more hours of service.

More time also is being taken for clinker and ash grinder inspection, so that worn parts, especially hammers, can be removed promptly and built up with welding, and thus made to give twice the service than if allowed to wear down completely.

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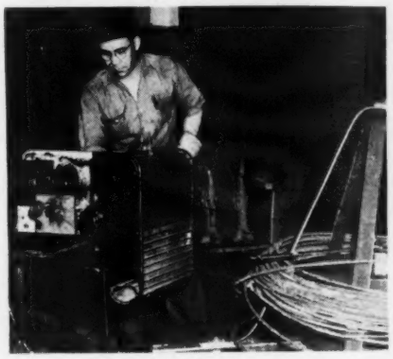
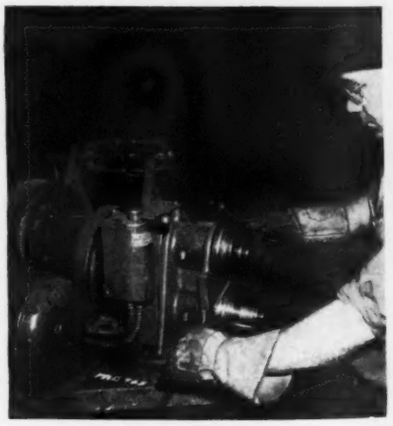
Wire Brushes Strip Salvaged Wire

Instead of tossing short pieces of insulated distribution wire into a furnace, burning the insulation off and selling the copper for scrap, the New



SCRAP WIRE is run through a machine which removes all insulation with wire brushes adjustable for different sizes and rotated in opposite directions



CLEANED ENDS of the wire receive a sleeve and are then run through the splicing machine where heavy pressure makes a practically inseparable bond

York Power & Light Corporation uses a timelier salvage method. Pieces of 15 ft. or more in length left over from maintenance work or removed during a rebuilding job are classified, inspected and spliced into long sections. All are classified according to size and type of wires. Smaller pieces are

conditioned for use as tie wires at insulators. About 60,000 lb., or about two carloads, of distribution wire was reclaimed in this manner by the utility company in 1941; the 1942 figure will probably be higher.

•

Boiler and Turbine Inspection Check-list

Enumeration of the steps followed by an Eastern utility in inspecting, and overhauling if necessary, the major equipments and the auxiliaries provides a convenient check-list of items to cover in setting up the detailed program.

Thus, during an internal inspection of a turbo-generator unit the unit is dismantled, inspected and repaired as indicated necessary. Principal items in such an inspection and maintenance routine are the following:

1. Check wheel clearance as found against similar clearance at last inspection.
2. Inspect shaft seals.
3. Check all blading for scale deposits, erosion, damage and rubs.
4. Magnaflux all spindle blades for cracks.
5. Inspect diaphragms.
6. Inspect all bearings.
7. Inspect throttle valve and admission valves.
8. Inspect main governor and overspeed trip.
9. Inspect turning gear.
10. Inspect main oil pumps.
11. Inspect auxiliary oil pump.
12. Drain and inspect oil tank. Inspect oil coolers.
13. Centrifuge the oil.
14. Inspect main condenser and auxiliaries.
15. Inspect vacuum trip or atmospheric relief valve.
16. Inspect steam strainers.
17. Inspect generator field and armature.
18. Inspect hydrogen cooling system.
19. Inspect sealing water tank.

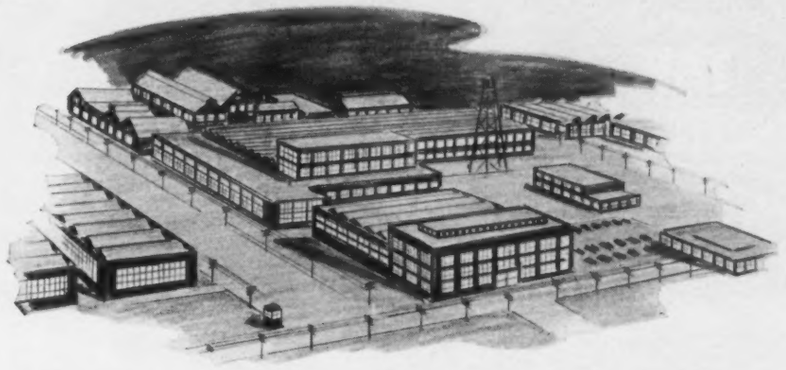
After turbine is reassembled, check balance, test main and emergency governors.

The formal report of this internal inspection lists the following:

1. Turbine number, generator number.
2. Date and duration of this inspection.
3. Date of last previous inspection.
4. Kw.-hr. generated since last inspection.
5. Replacements since last inspection.
6. Total turbine and generator outage for repairs since last inspection.
7. Oil replacement since last inspection.
8. Complete report of inspections made, conditions found, and corrections made, during this inspection.
9. Name of insurance inspector present.
10. Name of manufacturer's service engineer present.
11. Name of company representatives present.

At the time of internal inspection

How to Avoid Using Critical Materials



Use Hemingray Glass Insulators for Inter-Plant Wire Construction Lines

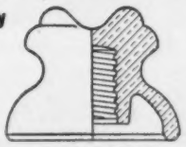
Your inter-company primary and secondary power distribution lines, your fire alarm, communication, watchman's signal, outdoor and protective lighting systems . . . when built on Hemingray glass insulators . . . *do not use* the vast amount of critical material that cable and other types of construction take.

Moreover, no weather is too tough, too quickly varying in temperature, to impair the efficiency of Hemingrays. Reason for it lies in secret Hemingray glass batch-mix—climax of 87 years' experience. Plus Owens-Illinois production-control that results in insulators free of voids, strains and stresses . . . So homogenous that they are unimpaired by sudden temperature changes and impervious to moisture-penetration.

Cost? low to begin with—lower in service life. Hemingrays sold *only* through jobbers.

30 Hemingrays Ready to Solve Your Inter-Plant Problems

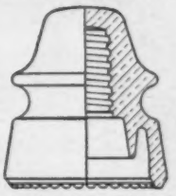
10 Hemingrays for Primary Power Distribution



From this group you can choose Insulators with the following range of characteristics:—

• *Critical Impulse Flashovers* ranging from 75 to 120. • *Leakage Distances* ranging from 4 to 9½ inches. • *Dry Arcing Distances* from 2⅜ to 4⅝ inches. • *Wet Arcing Distances* from 1 to 1¾ inches.

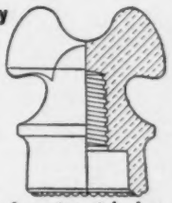
5 Hemingrays for Your Signal Work



From this group you can choose Insulators with the following range of characteristics:—

• *Heights* ranging from 3-13/32 to 4 inches. • *Diameters* ranging from 2¼ to 3¼ inches. • *Groove Diameters* ranging from ⅜ to 11/16 inches. • *Thread Diameters* standard at 1 inch in all 5 numbers.

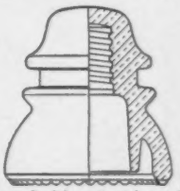
10 Hemingrays for Secondary Power Distribution



From this group you can choose Insulators, Knobs and Spools with the following range of characteristics:—

• *Heights* ranging from 2-15/16 to 5-1/32 inches. • *Diameters* ranging from 2¼ to 3¼ inches. • *Groove Diameters* ranging from 1 to 2 inches. • *Thread Diameters* at 1 inch in all 10 Numbers.

7 Hemingrays for Telephone and Telegraph



From this group you can choose Insulators with the following range of characteristics:—

• *Heights* ranging from 2-13/16 to 4-9/32 inches. • *Diameters* ranging from 2-7/16 to 3¾ inches. • *Groove Diameters* of either 7/16 or ⅜ inches. • *Thread Diameters* standard at 1 inch in all 7 numbers.

RUSH DELIVERY IF YOU NEED IT!

Complete stock of *all* types of Hemingrays are on hand. You can order as many or as few, as you need. Just 'phone your jobber. He can arrange *immediate* shipment.

USE COUPON FOR CATALOG

OWENS-ILLINOIS Company, Muncie, Indiana
Hemingray Division

Please mail a complete Hemingray Insulator Catalog.

Name_____

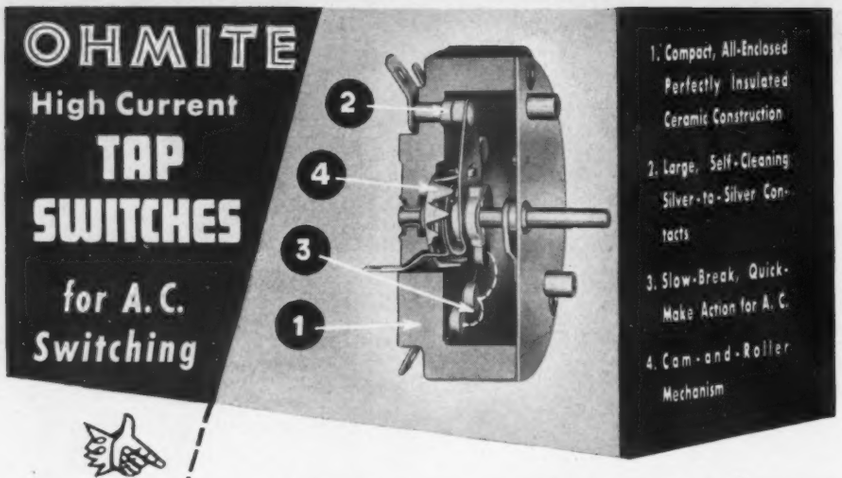
Street and Number_____

City_____ State_____

OWENS-ILLINOIS

HEMINGRAY DIVISION • MUNCIE, INDIANA

HEMINGRAY Power, Telephone and Telegraph Insulators



High Current Switching — *SIMPLIFIED*

The cut-away view shows some of the important design features of Ohmite non-shorting, load-break, single-pole, multipoint rotary selectors. These features, and many others, greatly simplify high current circuit switching and provide greater operating convenience—in battery chargers, tapped transformers, welders, radio transmitters, and other applications. There are five compact models, rated at 10, 15, 25, 50 and 100 amperes, A.C.—with any number of taps up to 11, 12, 12, 12 and 8 respectively. Also available in tandem assemblies.

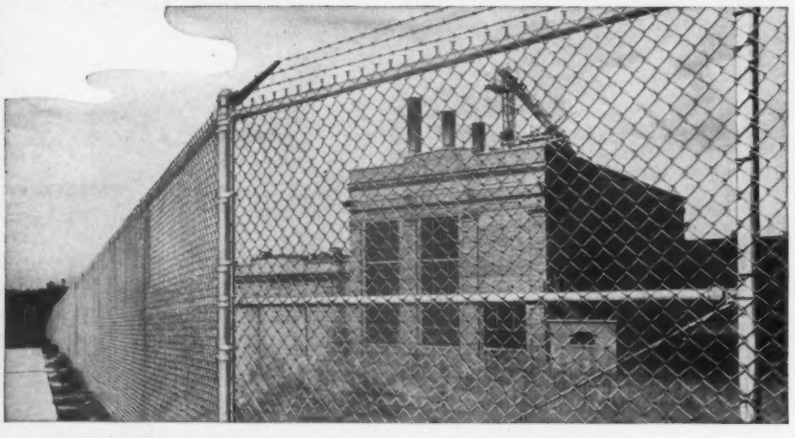
Send for Tap Switch Bulletin. Also write on company letterhead for complete Catalog No. 40 on Rheostats, Resistors and Tap Switches.

BE RIGHT WITH ★ OHMITE Rheostats · Resistors Tap Switches

OHMITE MANUFACTURING CO.
4949 Flournoy Street ★ Chicago, U. S. A

PAGE FENCE

America's First Wire Fence — Since 1883



BARRIER AGAINST INTERFERENCE WITH AMERICA'S ALL-OUT PRODUCTION

● No one can predict where treachery may attempt to strike, but utilities can and will set up protections. Logically the first barrier should be at all property lines. Two important factors favor Page Industrial Fence. The first woven wire fence was Page Fence, and for 59 years its makers have held a forefront position in major developments. Page also originated localized experience and responsibility in fence engineering and erecting. When you specify Page Fence you deal with a nearby business man—one of 102 technically-trained, long-experienced firms which own their own plants and comprise the PAGE FENCE ASSOCIATION, Headquarters: Monessen, Pennsylvania.

VICTORY FIRST
At the Page mills, men, machines and materials are on an all-out schedule for production of fence to protect plants working on Government orders

PRODUCT OF PAGE STEEL & WIRE DIVISION—AMERICAN CHAIN & CABLE COMPANY, INC., BRIDGEPORT, CONN.

of a steam-generating unit the boiler is removed from service, and the following inspections are made:

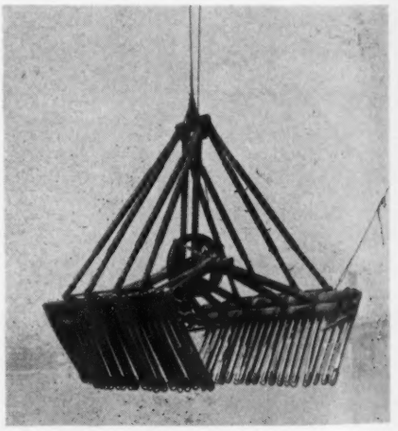
1. Internal inspection of drums and tubes.
2. Inspection of all baffles and tubes.
3. Inspection of all soot blowers.
4. Inspection of refractories.
5. Inspection of superheater tubes.
6. Removal of excess slag formations.
7. Inspection of forced and induced draft fans.
8. Inspection of air preheater.
9. Inspection of hydraulic couplings on fan drives.
10. Inspection of motors and controls.
11. Inspection of ash hoppers and sluice systems.
12. Inspect pulverizer coal burners or stokers.

•

Hog Fuel-Handling Equipment Improved

Two new types of equipment for handling hog fuel have been developed in recent months by the Portland General Electric Company, Portland, Ore., to facilitate the handling of fuel under conditions of greatly increased demand at Station L.

First is a new type "bucket" for lifting the fuel from barges. In the original type of bucket, with clamshell rig, in which the teeth are



ORIGINAL type of "bucket" for lifting hog fuel from barges; new type has curved teeth

straight, the action of these teeth is to pinch the fuel with a considerable amount of it escaping. In the new type bucket each 6-ft. tooth is formed as the arc of a circle with a 5-ft. radius. This design gives a clasping action to the bucket and practically all the fuel is retained, in lifting from barge to storage. The capacity of the bucket is one unit (200 cu.ft.); a unit, roughly, being equivalent to a cord of wood in heating value.

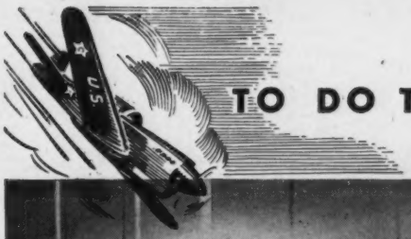
The other development is a new type of rake for dragging the fuel up onto the storage pile. This rake or drag is operated by steel cables from electric motor hoists. The old-type rake was a 6x14-in. timber reinforced. To the face of this were attached ten straight steel fingers, clevised to the timber and projecting above and below the edges of the latter. The main difficulty with this rake was that it could not be operated at an angle greater than 60 deg. from the horizontal.

The new rake consists of a semi-cylinder of steel, 3 ft. high by 10 ft. long, curved on an 18-in. radius. This is provided with 6-in. teeth

NEW semi-cylindrical rake to drag fuel onto storage pile

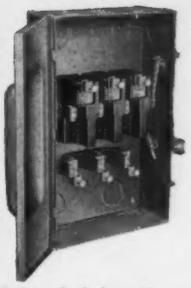
along the lower edge. It will operate at almost 90 deg., or almost straight up.

"Mt. Osborne," named after C. P. Osborne, general superintendent, recently contained 66,230 units of hog fuel, making it the largest mountain of sawdust thus far discovered in the world. Hog fuel receipts amount to 15,000 units per month. Maximum operation of the plant at full capacity requires 1,500 units per day, therefore it is necessary to draw upon the reserves in the pile at certain seasons and under certain conditions, while reserves can be accumulated at other periods. Oil is the auxiliary fuel in this plant. No oil has been used since last June. The maximum hog fuel pile (at 700 kw.-hr. per unit) represents over 46,000,000 kw.-hr.

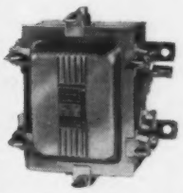


TO DO THE JOB BETTER...

MORE AND MORE MANUFACTURERS USE *Federal* SWITCHES ON JOBS LIKE THIS*



Safety Switches Type "A", "C" & "D" 30 to 1200 amperes Single and Double Throw



Weatherproof — Dust-tight Switches 30 to 1200 amperes

Complete line of circuit breakers and fusible panelboards

Today only one thing is important—Victory. There's no time left to lose—just time to WIN. That's why the men who know . . . the men turning out the planes, guns, ships and tanks are switching to Federal. The story's the same all over the country . . . wherever the pressure's on . . . wherever plants are going full blast twenty-four hours a day, seven days a week . . . wherever the job must be done better and faster . . . Federal Safety Switches are at work.

These "producers for Victory" find many advantages in Federal safety switches—trouble-free operation on essential circuits—ribbed arcing chutes—patented "griptite" fuse clamps—and many other exclusive Federal features. You will, too! — when you switch to Federal to get the job done better and faster.

*This photograph was taken in the plant of a large manufacturer of airplane parts. For obvious reasons the name of the manufacturer cannot be divulged.

FEDERAL ELECTRIC PRODUCTS COMPANY
54 PARIS STREET, NEWARK, N. J.
PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Proves Value of Customer Plant Data

By FRANK E. WIATT
Assistant Supervisor, Power Division,
Cincinnati Gas & Electric Company

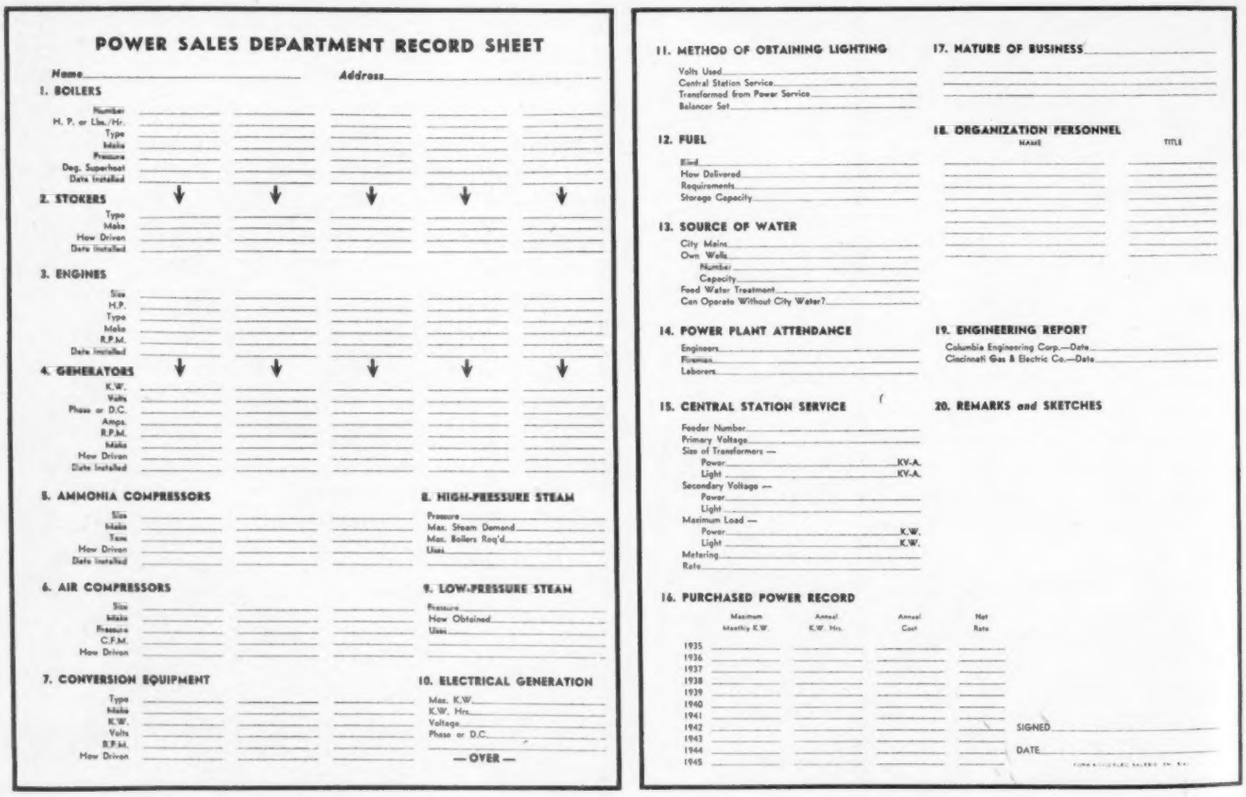
Sometimes we build better than we know. The power sales department record sheet used by the Cincinnati Gas & Electric Company and which is here illustrated was intended to be simply what it is called. It was that, and still is that, in perfectly satisfactory fashion. But it has had, and particularly in these war times, it has, other uses that greatly increase its value. Item:

1. In the 1937 flood the company lost its generating plants for a few days. The city water works lost its pumping plants for a considerably longer period. As generating units were placed back in service, it was desirable to allocate this capacity to customers who had a source of water other than city supply, and, for this reason, could resume operations before city water was restored. These records supplied this information and the plan was easily carried out.

2. When local plants began to obtain contracts for war work it was obvious that capacities would have to be increased. Numerous forecasts were made and these records provided a base for estimates.

3. Due to scarcity of materials and equipment, a demand has been created for used equipment such as engine generator sets, motor-generator sets, converters, etc. These records were a great help in getting into the hands of the used-equipment dealers information concerning equipment which was available, but not in use.

4. In view of curtailment of power in certain areas, it seemed advisable to prepare a study of available excess capacity of non-utility power producers. These records were invaluable in this connection.



POWER SALES DEPARTMENT RECORD SHEET

Name _____ Address _____

1. BOILERS
Number
H. P. or Lbs./Hr.
Type
Make
Pressure
Deg. Superheat
Date Installed

2. STOKERS
Type
Make
How Driven
Date Installed

3. ENGINES
Size
H.P.
Type
Make
R.P.M.
Date Installed

4. GENERATORS
K.W.
Volts
Phase or D.C.
Amps.
R.P.M.
Make
How Driven
Date Installed

5. AMMONIA COMPRESSORS
Size
Make
Tons
How Driven
Date Installed

6. AIR COMPRESSORS
Size
Make
Pressure
C.F.M.
How Driven

7. CONVERSION EQUIPMENT
Type
Make
K.W.
Volts
R.P.M.
How Driven

8. HIGH-PRESSURE STEAM
Pressure
Max. Steam Demand
Max. Boilers Req'd.
Uses

9. LOW-PRESSURE STEAM
Pressure
How Obtained
Uses

10. ELECTRICAL GENERATION
Max. K.W.
K.W. Hrs.
Voltage
Phase or D.C.

— OVER —

11. METHOD OF OBTAINING LIGHTING
Volts Used
Central Station Service
Transformed from Power Service
Balancer Set

12. FUEL
Kind
How Delivered
Requirements
Storage Capacity

13. SOURCE OF WATER
City Mains
Own Wells
Number
Capacity
Feed Water Treatment
Can Operate Without City Water?

14. POWER PLANT ATTENDANCE
Engineers
Firemen
Laborers

15. CENTRAL STATION SERVICE
Feeder Number
Primary Voltage
Size of Transformers —
Power KV-A.
Light KV-A.
Secondary Voltage —
Power
Light
Maximum Load —
Power K.W.
Light K.W.
Metering
Rate

16. PURCHASED POWER RECORD

	Maximum Monthly K.W.	Annual K.W. Hrs.	Annual Cost	Net Rate
1935				
1936				
1937				
1938				
1939				
1940				
1941				
1942				
1943				
1944				
1945				

17. NATURE OF BUSINESS

18. ORGANIZATION PERSONNEL
NAME TITLE

19. ENGINEERING REPORT
Columbia Engineering Corp.—Date
Cincinnati Gas & Electric Co.—Date

20. REMARKS and SKETCHES

SIGNED
DATE

DESIGNED as a sales tool, found most useful in war emergency

By Request:

THIS IS THE BOOK of which hundreds of dealers have said: "A real inspiration from cover to cover" . . . "Best thing I've read yet about a specific company and the war" . . . "It has given me new heart for the year ahead, a clearer understanding of what we are working for in the refrigerator business . . ."

Originally printed for the Kelvinator dealer family, this book has received so much comment—applies so directly to *every* forward-looking dealer today—that we are happy to announce a second edition for general distribution.

In this time of turmoil and indecision, we believe you will be gratified to see how one company is turning its peacetime production lines to lines pouring forth an endless stream of wartime weapons of destruction . . . and definitely states its position, its philosophy, its policies—and its approach to the dealer's postwar problems with activities already in operation.

Copies of this booklet have already been mailed to a wide list of appliance retailers. If you have not received your copy, write and it will be gladly sent you.

"GET IN THE SCRAP — BUY WAR BONDS AND STAMPS!"

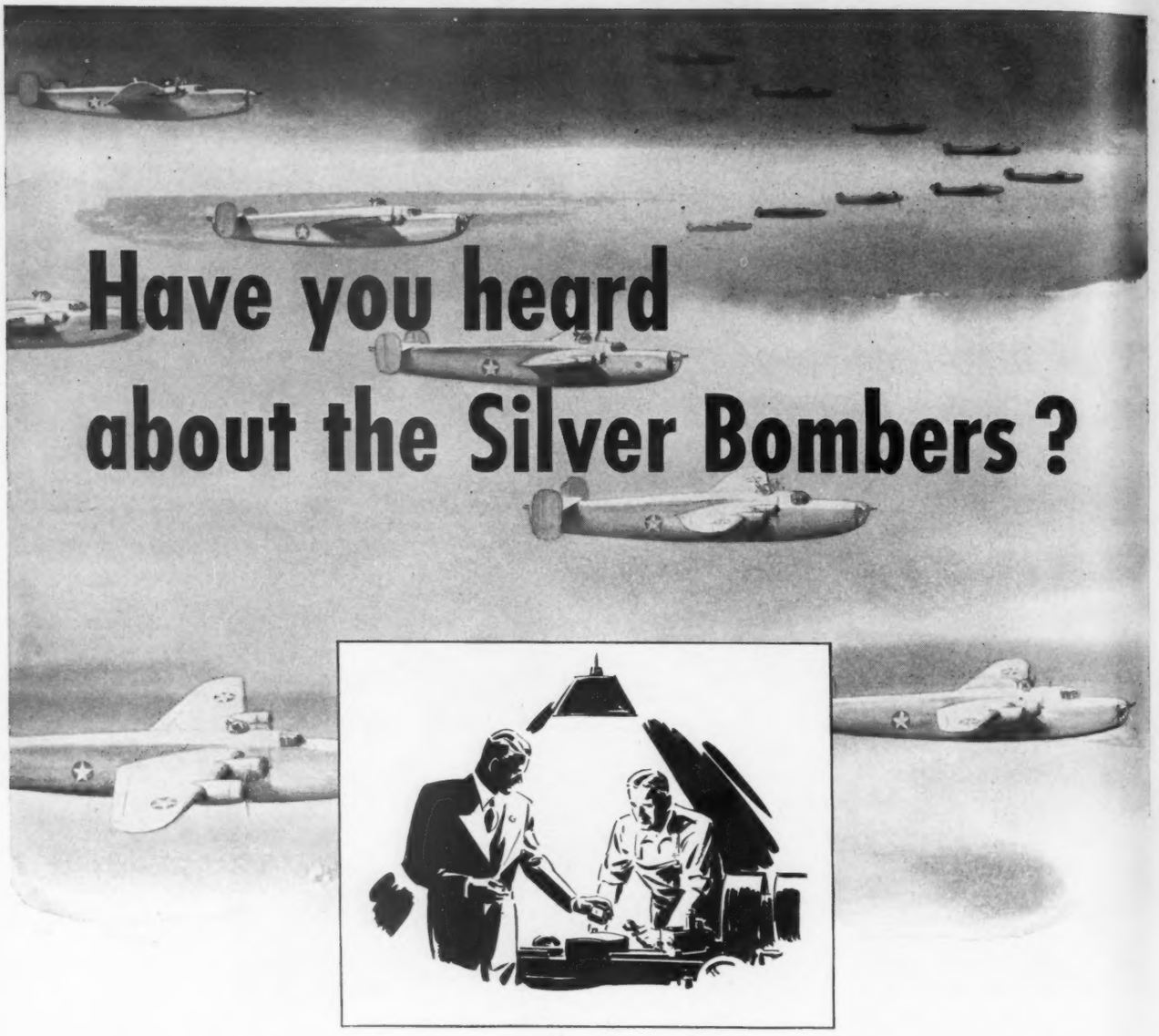
KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

PRATT & WHITNEY HIGH-ALTITUDE ENGINES

VOUGHT-SIKORSKY FLYING BOAT

HAMILTON STANDARD PROPELLERS



THE STORY OF 2606 MEN WHO ARE PLEDGED TO STEP UP PRODUCTION IN THOUSANDS OF WAR PLANTS

IT all began with the idea of one man. He was a lighting man devoting his time to helping war factories increase production through the use of better lighting. He was getting results. Over and over again he had seen production of essential war materials stepped up three per cent, ten per cent, even as much as twenty-five per cent after lighting faults were corrected. Accidents decreased. Spoilage went down.

One day he said to himself, "Since it takes 100,000 man-hours to build a four-motor bomber, every time I can add 100,000 man-hours by speeding production it's the equivalent of building a bomber myself!"

That idea has grown until, today, 2606 lighting men are enlisted in this symbolic "Bomber Building" army. Each has signed the pledge (Shown at right). And each is proud to wear the Silver Bomber button. Already, by the most conservative estimates these 2606 men are adding the equivalent of 54,000,000 man-hours a year to our war production. Enough man-hours to build more than 500 bombers!

Any lighting man leaving his job and going to work on a production line or a lathe could add 2000 hours of war effort. If, however, he puts his lighting experience to work, increasing production by removing lighting bottlenecks, he can greatly increase this figure . . . 45 men have added an average of more than 100,000 man-hours each to war production. Certainly a goal of 50,000 man-hours added by the efforts of each lighting man is well within reach.

G-E MAZDA LAMPS

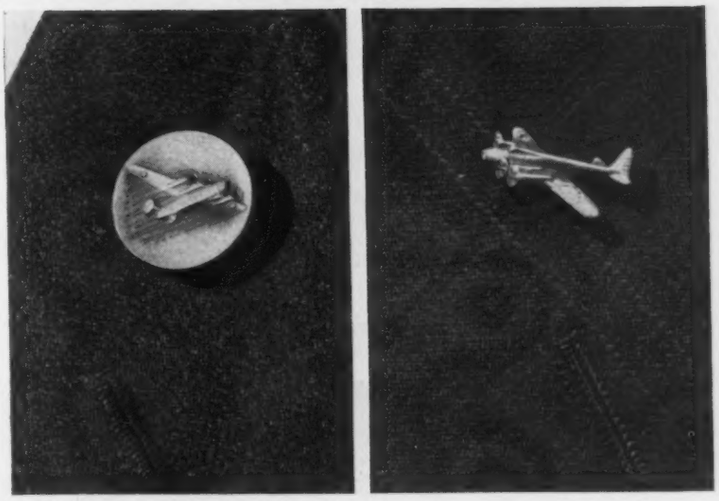
PLEDGE
I accept this Silver Bomber as a symbol of the goal —greater war production—to which I am dedicating my time and effort.
Insofar as I am able, I will locate and help to remove from war industry all the lighting bottlenecks which are interfering with production.
In suggesting lighting improvements, I will keep in mind the need for making the minimum of changes and using the minimum of critical materials, consistent with obtaining favorable production increases.
I shall make it my daily job to see that lighting is being properly used to "help win the war."
Signed John G. Allen
Company
Address
Organizer
Craftsman
(Please check one)

THIS IS THE PLEDGE that 2606 lighting men have signed (as of October 30) indicating their determination to help war plants speed production with better lighting. Of these 2606 men, 45 have already added over 100,000 manhours each to war production, and 60 others will soon reach the same goal.

General Electric is glad to publish this tribute to the Wartime Lighting Counsellors who are doing so much to speed war production. They include lighting men from Electric Service Companies, Electrical Jobbers, Contractors, and Manufacturers as well as from General Electric's own lighting staff.

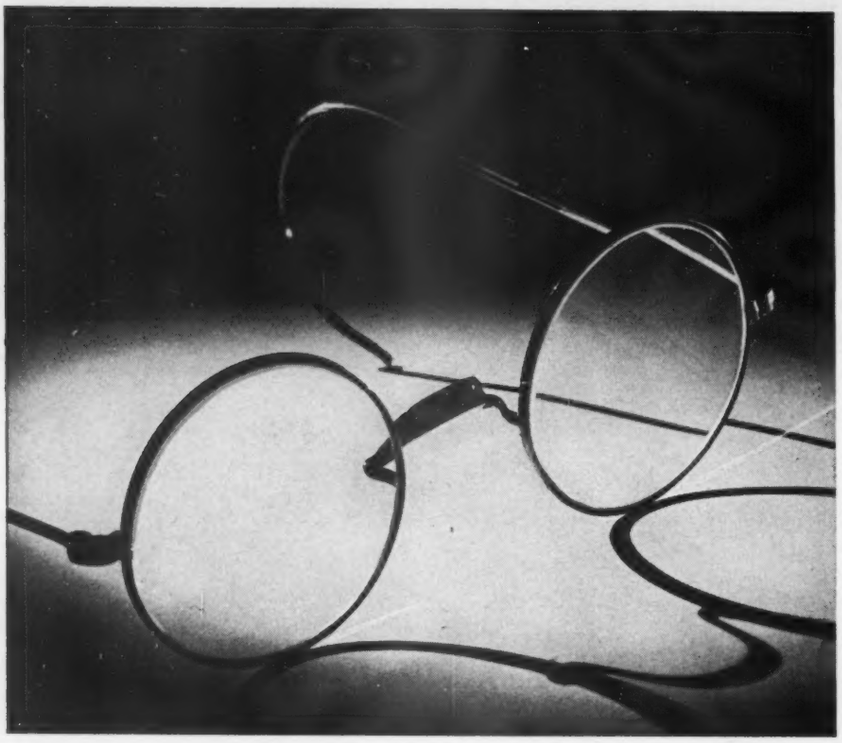
* * *

If you are interested in becoming a member of this "Bomber Building" army, or if your company is interested in joining this activity, you can get full details at your nearest G-E lamp office or by writing General Electric Company, Nela Park, Cleveland, Ohio and asking for complete material and plans for the Silver Bombers, which are now available.



AT THE LEFT is shown the Silver Bomber lapel button worn by lighting men who have signed the above pledge. **AT THE RIGHT** is the Gold Bomber pin which is awarded to each of those lighting men who have "built a bomber" by adding 100,000 man-hours to war production by improving plant lighting. Already 45 men have won Gold Bombers.

GENERAL ELECTRIC



There will be FEWER OF THESE

Eyeglasses symbolize eyestrain. By reducing eyestrain through proper lighting, your war production can be increased both in quantity and quality. Fewer man-hours will be lost, fewer rejects will come off your production lines.

Silv-A-King offers a complete lighting service—fine equipment (either fluorescent or incandescent) plus skillful engineering to lay out your lighting installation for maximum effectiveness. Our ability to serve you well in lighting comes from 21 years of experience as industrial lighting specialists. A Silv-A-King lighting engineer is at your call wherever you are located.

Bright Light Reflector Company, Inc.,
1035 Metropolitan Avenue, Brooklyn, N. Y.

Write for new, 16-page Silv-A-King book:
"Light Is An Essential Production Tool"

A Few Typical Silv-A-King Users:
AC SPARK PLUG
GENERAL MOTORS
FISHER BODY
INTERNATIONAL HARVESTER
JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
and many others

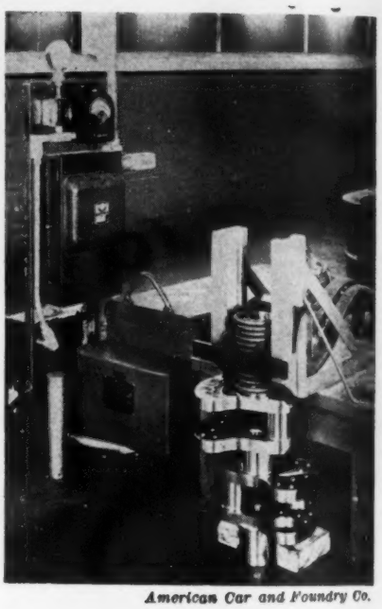
FLUORESCENT · INCANDESCENT
SILV-A-KING
EQUIPMENT

SILV-A-KING MAKES *Light* WORK FOR YOU

The power sales engineer has many occasions when a complete source of information on his customers and isolated generating plants is of great value. These record sheets provide this information in a compact form on all isolated plants and on customers having demands of 25 kw. or more. A master file is kept in the office of the department head and a file on his own customers and on the isolated plants in his territory is kept by each power sales engineer.

•

Low Frequency Induction Heating



American Car and Foundry Co.

Bushings are shrink-fitted into the hollow ends of aircraft engine crankshafts by means of a Berwick 60-cycle induction heater which raises the temperature of the shaft wall to 400 deg. F. in around three minutes. The drilled bushing is then easily inserted.

•

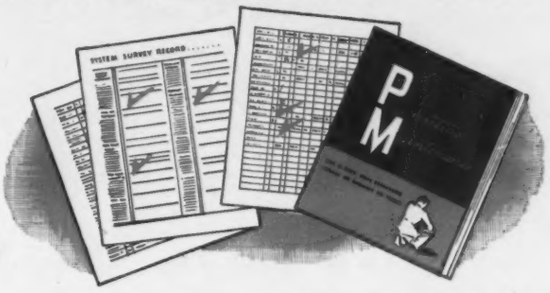
Infra-red Dries Stokers in 9 Minutes

By the use of an infra-red drying tunnel synthetic lacquer enamel finishes on stokers are dried in nine minutes at the Cleveland plant of the Iron Fireman Manufacturing Company. This time for the operation is reduced to 1.25 percent of the former requirements—twelve hours with the discarded air-dry method.

The tunnel contains 144 250-watt

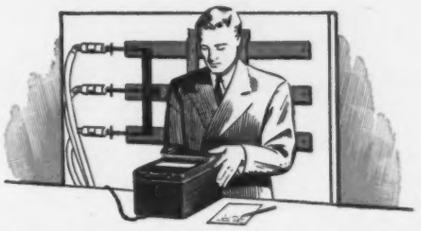
How to stop production losses through Anaconda's PREVENTIVE MAINTENANCE Plan

1 **Send for this plan designed to prevent electrical system failures before they develop.**



With raw materials so critical—copper and rubber especially—Anaconda has developed a plan to help industry protect its electrical systems and at the same time, conserve critical materials. It is a practical, simplified manual prepared to meet wartime conditions.

2 **Use this plan periodically to check your electrical system for imminent failure.**



Manual includes special charts for analyzing your plant's electrical system, and for keeping a running check on its condition. Automatically uncovers danger spots . . . suggests a practical remedy for potential weaknesses.

3 **If the plan uncovers any critical complications, consult with Anaconda engineers.**

On critical problems, we offer the services of our engineering department and field service staff without cost.

NOTE: The Preventive Maintenance Plan will aid your local W.P.B. Branch in making its decision on your request for material required to avert an actual breakdown. 42277

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda PM Plan, including posters, extra check charts, etc.

Individual .....

Company .....

Address ..... City .....

114

Mr. Wartime Lighting Counselor:

WAR PLANTS GET THE LIGHT THEY NEED---WHEN YOU *Plan and Specify*

Guth FLUORESCENT

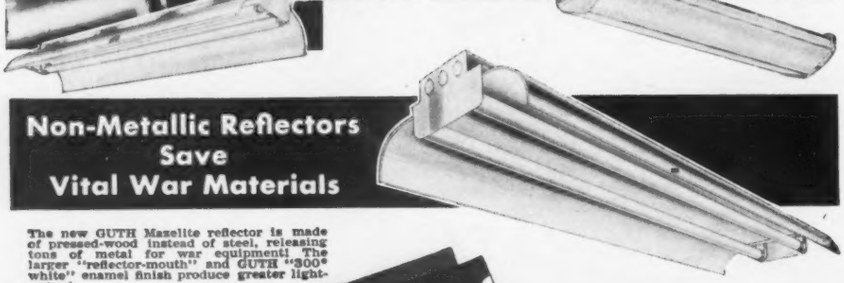
You are performing a tremendous service for America by helping get the utmost production out of War Plants with the aid of better lighting. Your plans are carefully developed and properly engineered. By specifying Guth Engineered Fixtures, you insure ultimate lighting results from your layouts.

Our 40 years of experience have built quality and dependability into every GUTH Fixture—and our production methods meet today's demands for prompt shipment on orders of 1 to 1000 units.

Write for New Literature to get better acquainted with GUTH Products.

For FACTORIES: GUTH Engineered Fluorescent provides quick, easy seeing for accurate work. In the installation pictured at left, color matching and close inspection are quickly and successfully done under 30-32 foot-candles at floor level.

For ENGINEERING OFFICES AND DRAFTING ROOMS: It's equally important to have good lighting where production is started and controlled. There's a GUTH Unit for every need. In the installation below, shadows are minimized; and in spite of the low mounting level, direct glare is practically non-existent.



Non-Metallic Reflectors Save Vital War Materials

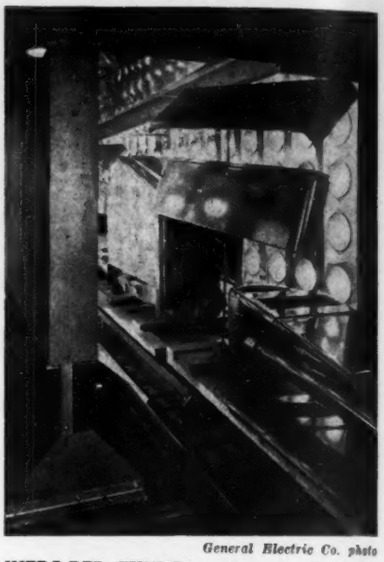
The new GUTH Masolite reflector is made of pressed-wood instead of steel, releasing tons of metal for war equipment! The larger "reflector-mouth" and GUTH "300° white" enamel finish produce greater light-output.

FORTIETH YEAR OF Guth LIGHTING LEADERSHIP

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

PS-30 drying lamps in 12-in. Hall reflectors. The lamps are mounted on approximately 12 x 15-in. centers and in two flat movable banks which face each other.

Lamp-to-work distance is from 1 to 2.5 ft. Cooling drafts are minimized and stray radiation is redirected onto the work by baffles at the bottom of each bank.



General Electric Co. photo

INFRA-RED TUNNEL with movable banks and bottom baffles to redirect stray radiation

•

New Responsibilities for Rural Specialists

Manpower shortages on the farms, coupled with the increased production schedules assigned to agriculture, have so increased the responsibilities and work of rural electrification representatives that Puget Sound Power & Light Company has requested draft deferment for its farm specialists. Also new direction has been given to the farm electrification program.

Specialists direct their efforts in four channels aimed at giving the farmer the most help and the best possible service. These are:

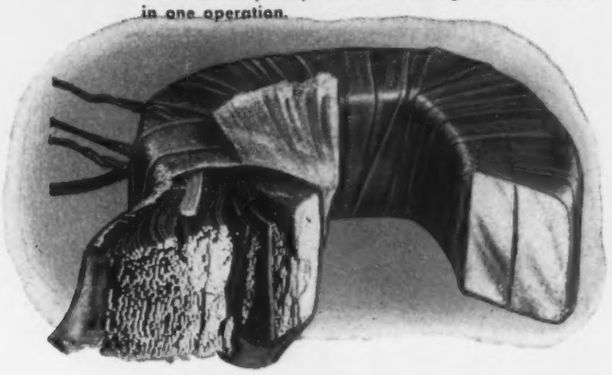
1. Rehabilitation of obsolete and discarded farm equipment so as to renew its useful life.
2. Maintenance of a clearing house for trading and borrowing of farm equipment between farmers.
3. Devising and explaining miscellaneous new labor-saving mechanical applications for use on farms.
4. Maintenance of a clearing house for information on all recent discoveries for increased food production.

In six months operation under this

Cut baking time in half! WITH HARVEL 612-C VARNISH

Several coats of Harvel 612-C Varnish may be applied by merely allowing a one-hour bake between dips, and the completely treated winding can be baked in one operation.

These coils made by the Magnetic Windings Company are being lowered into the impregnating tank for Harvel treatment.



Coil consisting of 2500 turns of No. 24 enameled wire impregnated with Harvel 612-C and baked 8 hours showed perfect bonding and curing throughout.

When insulating coils and windings with varnish, why spend 48 hours in baking three coats of ordinary varnishes, when three coats of HARVEL 612-C Insulating Varnish can be baked and thoroughly set in 20 hours?

Not only does HARVEL 612-C cut baking time in half, but it insulates better because electrical windings are:

- **Dry Throughout**
- **Oil Proof**
- **Acid and Alkali Resistant**
- **Resists High Temperatures**

HARVEL 612-C INSULATING VARNISH is an internal drying type, which penetrates the innermost interstices of windings; sets an infusible state after baking; perfectly bonds even the smallest wires and keeps them in place. This varnish is comparable to phenol-aldehyde varnishes but there is this difference: the mildest solvents it is possible to use are included in 612-C. These solvents do not attack the enamel coating of magnet wires.

Because HARVEL 612-C solidifies throughout by heat-induced chemical polymerization and not by oxidation, there is no semi-liquid varnish that can run or ooze from coil interiors when they are heated or stressed in service.

This varnish will not soften or "throw out" on equipment operated at elevated temperatures nor on motors rotated at high peripheral speeds.

HARVEL 612-C INSULATING VARNISH can be applied on all classes of electrical windings, regardless of type, size and construction, either by vacuum and pressure impregnation or by dipping or brushing.

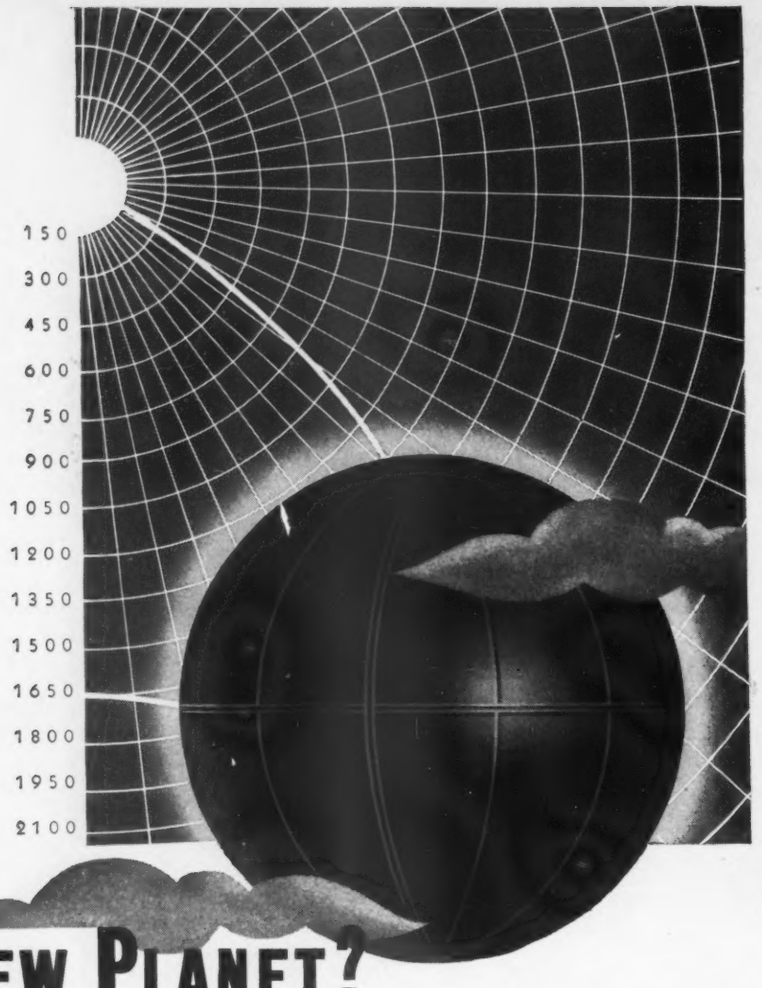
Write Dept. 46 for complete catalog of HARVEL and IRVINGTON VARNISHES.

Send for complete Insulating Varnish Manual—contains 34 pages of pictures; charts; descriptions of 31 different insulating varnishes, paints and enamels; and application directions.

STANDARD OF THE WORLD
IRVINGTON INSULATION

IRVINGTON
VARNISH & INSULATOR CO.

IRVINGTON NEW JERSEY, U. S. A.
Plants at IRVINGTON, N. J. and HAMILTON, ONT., CAN.
Representatives in 20 Principal Cities



NEW PLANET?

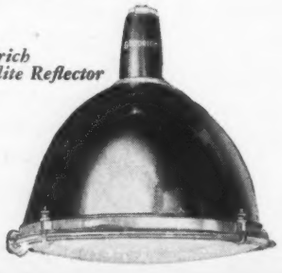
NO. But new worlds of information are charted in this huge spherical photometer, which is one of the instruments used in the Goodrich laboratory for the measure of light in its manifold applications to industry.

Here at Goodrich, all interests converge on this one objective—*improvements in industrial illumination* through the development of fixtures to meet every kind of task and insure the clear, comfortable vision that means better work, done faster.

This modern laboratory, equipped with the most advanced scientific instruments, has given industry many notable achievements in lighting. Among recent developments is the new Goodrich Highlite Reflector, which delivers abundant illumination for large interiors without shadow or glare. It is but one of many hundreds of styles and sizes of Goodrich porcelain enameled lighting fixtures. Literature on request.

Protecting vital plants with floodlighting—saving man-hours in production—Goodrich industrial fixtures are serving America's war effort everywhere.

Goodrich Highlite Reflector



GOODRICH RLM

LIGHTING FOR INDUSTRY

GOODRICH ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4626 BELLE PLAINE AVENUE, CHICAGO, ILL.

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

new program rural representatives have assisted farmers in locating and installing 472 chick brooders, 86 water heaters, 97 soil heating devices, 213 milking machines, 69 dairy water heaters, 13 utility motors, 114 yard, barn and poultry lighting installations and numerous other types of equipment.

Because electricity is being recruited to replace human labor, farm loads have been increased to the point of overloading wiring systems. Here too the rural representatives have been of service in revamping wiring systems and wiring jobs so as to conserve materials.

Experimental work continues in the company's Puyallup farm electrification laboratory and one of the newest developments is a practical and economical home-made fruit and vegetable dehydrator.

•

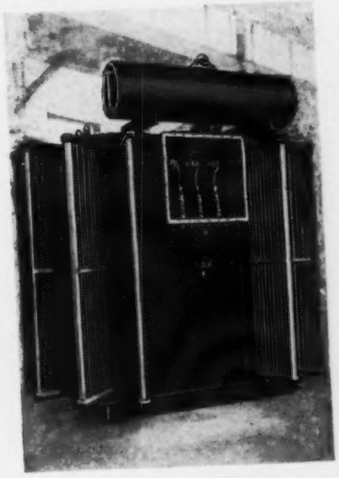
Boosts Dealer Appliance Service

"Many local electrical dealers are developing expert repair departments. Inspect all your appliances. Put them in order. They'll save time and energy for you. For advice on use and care, see our home service department. For repair service see your local dealer."

That's the text of the above advertisement by which the Hartford Electric Light Company gives public emphasis to the electrical dealer's important place in the appliance conservation picture.

POWER

UPTEGRAFF *Transformers*



Uptegraff Power Transformer, Primary Side

Uptegraff Power Transformer, Secondary Side

Into every Uptegraff Transformer enters a combined quality of skilled electrical and mechanical engineering design, together with master shop craftsmanship, possible only in an organization devoted exclusively to the production of one basic line of products.

This specialized line, produced complete in a plant of moderate size, gives exceptional facilities to meet many varying and unusual Transformer requirements. We ask that you tell us your needs.

While meeting every call on us for the Transformer needs of our own country and of our united allies, there has never been a time that we couldn't "take on more" to further the war effort.

If we can serve you we are here—with engineering experience, manpower, shop facilities—and most of all, with heads and hearts in building Transformers and in our country's needs.

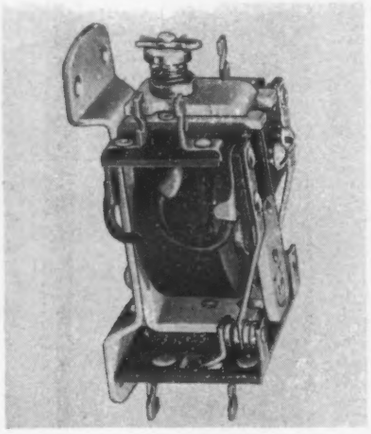
R.E. UPTEGRAFF *Manufacturing Co.*
SCOTTDALE · · · PENN'A · U·S·A·

SERVING *The* UNITED NATIONS UPTEGRAFF

NEW EQUIPMENT

Relays

Available for operation on a.c. and d.c. circuits, small, compact remote-control units are adapted to applications within their ratings where space is limited. They are vibration resistant up to ten times gravity in the energized position.



"Bulletin 104" relays; height from base to armature, 1¼ in.; ratings, 4 amp. up to 24 volts a.c. or d.c. and 4 amp. a.c.; 1 amp. d.c. from 25 to 115 volts. **Ward Leonard Electric Co.**, Mt. Vernon, N. Y.

•

Wire Lift Attachment

Claw-like attachment for Chance safety pike pole is stated to be useful to linemen for lifting wires, rope, service drops, etc., and helpful in stringing lines over boom or around limbs.

Lift attachment for safety pike pole. **A. B. Chance Co.**, Utilities Division, 210 Allen Street, Centralia, Mo.

•

Stripping Material

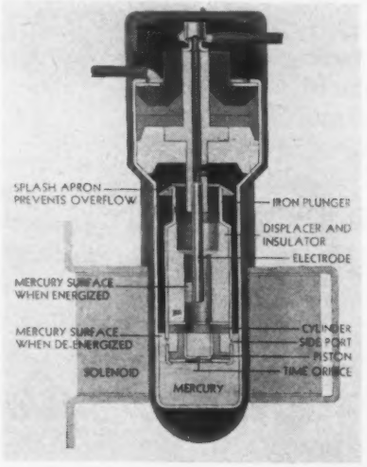
"Fel-Pro" Thiakol strip material for gaskets and strips. **Felt Products Manufacturing Co.**, 1530 Carroll Ave., Chicago, Ill.

New weather-resistant strip material, produced by the application of Thiokol to a processed felt base, serves as a substitute for critical materials used in gaskets and strips.

•

Relays

Time-delay relay, designed for use in communication systems, machines, motors and electrical circuits where time intervals are required at the beginning or the end of the cycle; is also useful in recycling operations or flasher actions. Explosion-proof and noiseless, the relay cools, quenches and preserves its contact as it operates.

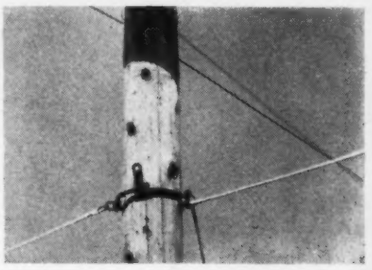


"Series BKV" Durakool Timer; "B" model, shown, has maximum of 30 amp. **Durakool, Inc.**, 1010 N. Main St., Elkhart, Ind.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Safety Tongs

New guy tongs, designed to steady and hold in position poles of various heights which are weakened at the base, are made of heavily fabricated steel and may be installed with a pike pole. When the tong has been put in position the ends of the circular arms are crossed and pulled together with ropes, permitting the spikes to grip the pole securely.



Safety guy tongs will fit poles up to 11 in. in diameter. **James R. Kearney Corp.**, St. Louis, Mo.

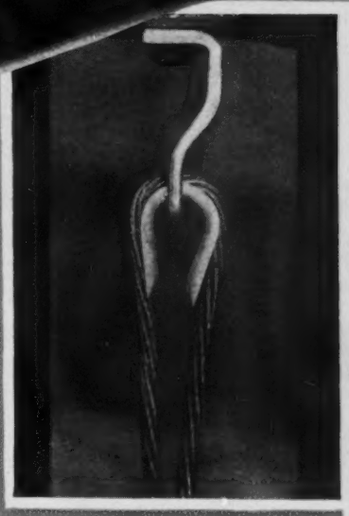
•

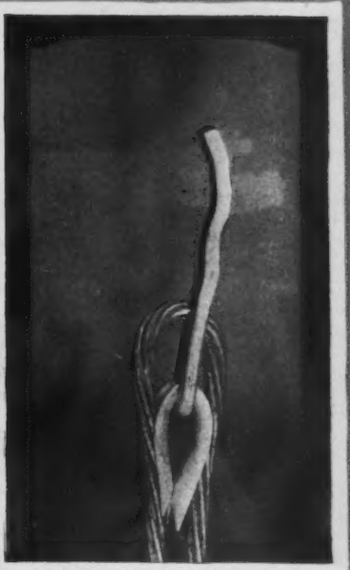
Tensile Tester

New table-unit with level indicator and safety glass for stress testing of materials will check specimens up to a foot in length and can handle 10,000 lb. Grips can be provided for tests on separational pull of sockets, etc.

"Model B" table-unit tensile tester; 100 per cent overload protection, universal loading adjustment for temperature variation. **W. C. Dillon & Co., Inc.**, 5410 W. Harrison St., Chicago, Ill.

The Phantom Lineman



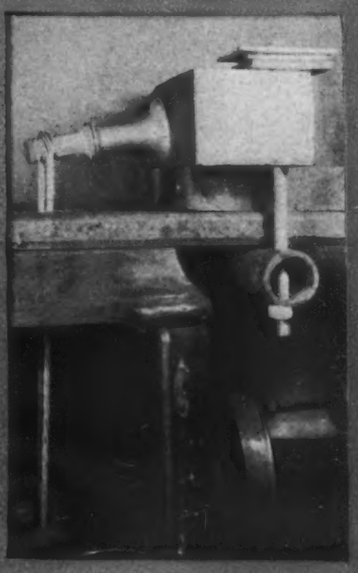


Wherever your power or communication system may serve; whatever its hazards may be and whether your crew is made up of one or hundreds of workers, the Phantom Lineman is also there working for you. He is on the pole, hard at work while your men are eating lunch and he is there when they are off duty recuperating for the next day's labor.

He is revealed for the first time by the accompanying photos showing how only a few of many hundreds of tests are carried out to insure the highest possible quality in Hubbard Pole Line Hardware.

For the Phantom Lineman is none other than old man "Test", the fellow who puts his finger on the bugs in a product. He is the one who checks the stresses, strengthens the weak spots, trys the practicability of the item and then stands by while it is in service on your lines.

He notes with satisfaction that his work has enabled your service to hold up through a severe winter storm, spring sleet or burning desert heat. He is the phantom who started his work in the Hubbard test laboratory and continues, shoulder to shoulder with your linemen.



"HANG THE LOAD ON HUBBARD HARDWARE"

HUBBARD AND COMPANY

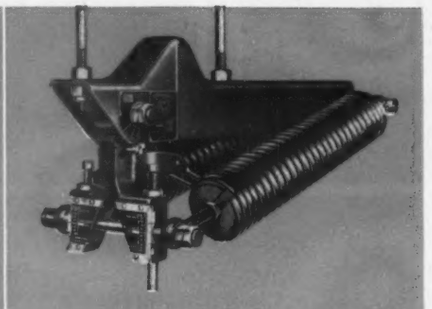
PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

FLUID TRANSPORT — What does it mean? It means carrying steam from a boiler at 2000 pounds per square inch; vapor from a refinery still; gas from a tank; water from a reservoir. It means more than that. It means compensating for such factors as heat and cold, expansion and contraction, pressure – factors as important in themselves as the fluid to be transported. It means the manufacture and fabrication of the many connecting links that convert a pile of pipe into a piping system.

GRINNELL

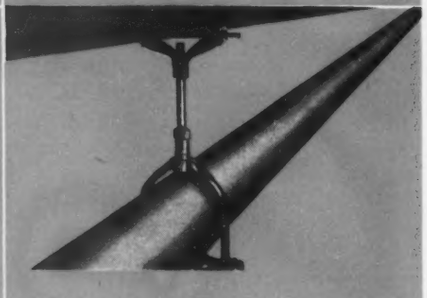
FLUID TRANSPORT

1 PREFABRICATED PIPING—Complete sub-assemblies that are pre-tested for strength, underwriter approved and easy to erect.



2 GENSPRING CONSTANT-SUPPORT HANGERS—Mass produced, yet prefitted to exact engineered layouts . . . safeguard high-temperature piping systems.

3 PIPE AND TUBE FITTINGS—Steel, cast iron, malleable iron, brass, aluminum . . . screwed, flanged, socket, flared tube and welding.



4 ADJUSTABLE PIPE HANGERS engineered to provide the right hanger for ANY piping ANYWHERE. Faster to install . . . stronger . . . adjustable after installation.

DATA FOLDERS on these and other Grinnell piping products will be gladly furnished. Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of United States and Canada.

GRINNELL

WHENEVER **PIPING** IS INVOLVED

TECHNICAL LITERATURE

CABLE—A joint report combines essential features of the annual cable operation reports which in previous years have been prepared separately by committees of the Association of Edison Illuminating Companies and of the Edison Electric Institute. "Cable Operation—1940," publication No. J-3, may be obtained from E.E.I. headquarters, 420 Lexington Ave., New York, N. Y.; price $1.25 to non-members in U.S.A.

INFRA-RED HEATING APPLICATIONS—"Flashes No. 942," a brochure of 32 pages, contains over 100 illustrations and descriptions of industrial applications of paint baking, drying, dehydrating and preheating by use of radiant heat, preceded by explanations of what infra-red heating is and how it operates. "Flashes No. 942" is obtained from Fostoria Pressed Steel Corp., Fostoria, Ohio.

PREHEATING CHART—Preheat temperatures for 79 principal ferrous and non-ferrous alloys are listed on a wall chart, 18x23 in., which may be obtained from Tempel Corporation, 132 West 22d St., New York, N. Y. Your request is to be made on your company's letterhead and over the signature of a responsible executive or technician.

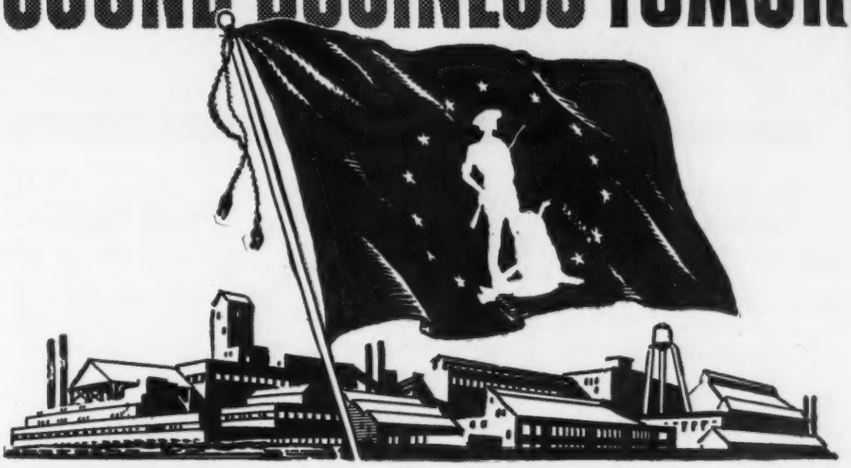
CONDENSATE OR BOILER WATER TESTS—Method of operation of measuring apparatus such as Solu-Bridge controller, conductivity cell, sample cooler and cell holder, also a description of and how to select the apparatus are given in a four-page bulletin, "Solu-Bridge Conductivity Apparatus for Boiler Water and Condensate." The bulletin, No. RD-104, is obtainable from Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.

SWITCH STANDARDS—A new publication No. 42-78, entitled "Inclosed Switch Standards," includes general, performance, rating and marking standards for air break switches having their current-carrying parts inclosed in metal cases and inclosed switches with or without provision for plug or cartridge enclosed fuses. Copies may be obtained from National Electrical Manufacturers Association, 155 East 44th St., New York, N. Y.; price 60 cents per copy.

MOTORS—Electrical and mechanical characteristics of motor types designed for the specific application, for squirrel-cage, wound-rotor, direct-current, and synchronous motors, are given in a compact motor manual. Speed-torque curves, engineering phases of motor application, dimensions and prices are likewise included in Bulletin B-6052-C, available from Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

MAINTENANCE HINTS—To keep the tools of war industries in full operation, two pocket-size volumes have been prepared to facilitate the care of electrical apparatus. Written by Westinghouse engineers, the books total 220 pages and include fifteen chapters on inspection, cleaning, drying and testing of insulation; commutator maintenance, starting and regulating motors, with contactor maintenance hints, material on transformer inspection, connections and wiring diagrams. Vol. 1 sheets are permanently attached to a 5x7-in. binder and Vol. 2 contains loose-leaf sheets to facilitate keeping the material up to date. Copies of these notebooks are available to maintenance men from Department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW



Get This Flag Flying Now!

This War Savings Flag which flies today over companies, large and small, all across the land means *business.* It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow,* keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Payroll Savings Plan, *now is the time to do so.* For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW., Washington, D. C.

EVERYBODY EVERY PAYDAY AT LEAST 10%

Save With

War Savings Bonds

This Space Is a Contribution to America's All-Out War Program by

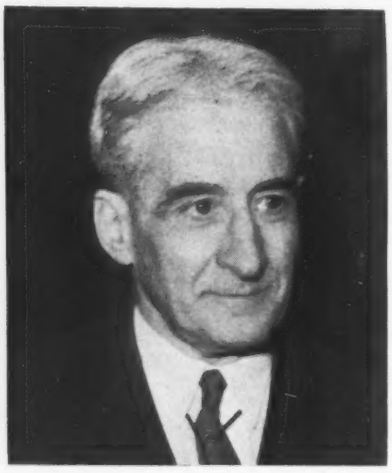
ELECTRICAL WORLD

NEWS ABOUT PEOPLE

Gerard Swope Awarded Hoover Medal for 1942

Gerard Swope, president of the General Electric Co., has been selected as the sixth recipient of the Hoover Medal, the American Society of Mechanical Engineers has announced. He will receive the award during the winter convention of the American Institute of Electrical Engineers in New York during the week of January 25.

The Hoover Medal is administered by the Hoover Medal Board of Award, consisting of representatives of the A.I.E.E., A.S.C.E., A.I.M.E., and A.S.M.E. It was formally instituted in 1930, during the celebration of the fiftieth anniversary of the A.S.M.E.



The citation follows: "Gerard Swope, engineer and distinguished leader of industry, ever deeply interested in the welfare of his fellowmen, whose constructive public service in the field of social, civic and humanitarian effort has earned for him the Hoover Medal for 1942."

•

► J. Manning Francis, for the past 14 years superintendent of the San Antonio Public Service Co.'s properties in New Braunfels, Tex., has been appointed by Mayor Walter Sippel as manager of that city's electric distribution system. With the city's recent purchase from the city of San Antonio of the local distribution rights, Mr. Francis was selected for the superintendency. He has been connected with the San Antonio Public Service Co. since 1919.

•

L. L. Ferree Elected Head of Louisiana Utility

L. L. Ferree has recently been elected president of the Gulf Public Service Co., New Iberia, La. Mr. Ferree has been associated with public utility operations since 1903.

He was first identified with the electric utilities at Harrisburg, Pa., and became general superintendent of the consolidated companies under the direction of the United Gas, Electric & Engineering Corp. Later he entered the employ of the Salem Electric Co., at Salem, Ohio, holding this position for approximately three years.

He then held the position of general manager of the Georgia Power Co. for a period of five years and subsequently assumed the duties of general manager of the Southwestern Public Service Co. at Amarillo, Tex., severing that connection in 1930 to join the Gulf Public Service Co.

•

► John J. Strickland, general superintendent of the Durham Public Service Co., Durham, N. C., was elected chairman of the North Carolina section of the American Institute of Electrical Engineers at the recent fall meeting.

► Dale E. Washburn, head of the technical service division of Boston Edison's power sales department, has been appointed assistant power sales manager, under John T. Ward, vice-president and power sales manager.

Perry Succeeds Landers With Findlay Utility

John W. Perry of West Point, Va., has been named vice-president and general manager of the Central Ohio Light & Power Co., Findlay, to succeed Frank C. Landers, who is retiring after more than 38 years in the electric public utility business. The change will become effective December 1, Floyd W. Woodcock, president of the company, announced.

F. C. Landers

Mr. Perry was treasurer of the Central Ohio company for eight years from 1931 to 1939 and for the past three years has been vice-president and general manager of the Virginia East Coast Utilities, Inc., Richmond.

Mr. Landers has been associated with companies under Mr. Woodcock's management for the past 22 years. His experience includes operation of electric utility companies in New York, Maryland, Florida, Georgia, Texas, Louisiana and Ohio.

Mr. Perry is being succeeded by James G. McClellan, who was general manager of Louisiana Ice & Electric Co., Inc.

ORANGEBURG *Underground Suggestions*

. . . need standard or special bends *in a hurry?*

here's a practical suggestion from General Construction Foreman "X"

WE recently received a letter from John "X"—a well-known general construction foreman of a utility in the mid-west.

Although we cannot reveal his name, we have his permission to publish his letter. Here it is . . .

"When we need special or intricate conduit bends in a hurry—faster than we know it is possible to get them—we take straight lengths of Orangeburg from stock, and move them down to our power plant.

"We then take a length of flexible metallic tubing of a diameter slightly smaller than the I.D. of the Orangeburg and slide the tubing into the conduit.

"The 'open' end of the conduit is then closed with a tapered wooden plug, and the other end is caulked around the flexible metal tubing.

"Then steam is admitted to the tubing. In a very short time the Orangeburg Conduit is 'warm', and is easily bent to the desired radius and angle.

"The bend is then embedded in sand to hold it in shape while cooling. This method is fast—a crew of two of my men have made twenty bends in one hour."

If you want complete information on Orangeburg Conduit—what it is, how to use it, what it does, how it saves time, trouble and cable—then send for Catalog 42-E. A copy will be sent without cost or obligation.

ORANGEBURG *Conduits*

A lasting name underground for Forty-Nine Years

MADE AT ORANGEBURG, NEW YORK, BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY

Sales Agent-Distributors

GRAYBAR ELECTRIC CO., INC. GENERAL ELECTRIC SUPPLY CORP.

(offices in principal cities)

11-FC-1

MAILING LISTS THAT WORK...

McGraw-Hill Industrial Mailing Lists are a direct route to today's purchase-controlling executives and technicians in practically every major industry.

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Tenney Named President of Publishing Company

George C. Tenney, editor of *Electrical West*, has been elected president of the McGraw-Hill Company of California, publisher of that paper. At the present time Mr. Tenney is also Pacific Coast editor of ELECTRICAL WORLD. He was formerly vice-president of the McGraw-Hill Company of California.

Mr. Tenney has been prominently identified with the electrical industry

on the Pacific Coast since 1921, when he joined the staff of the *Journal of Electricity*, predecessor publication of *Electrical West*. It was in 1930 that he assumed the editorship of the latter.

Born in Utah in 1898, Mr. Tenney has lived in California since 1902. He was a member of the University of California electrical engineering class of 1920. For many years he has been active in the Pacific Coast Electrical Association, serving last year as president. He is also a past-president of the San Francisco Electric Club.

•

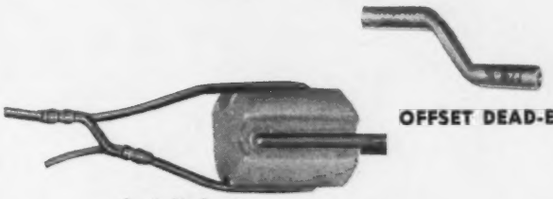
▶ HAROLD F. SMIDDY, head of the operating section of Ebasco Services, Inc., since 1940, has resigned. From 1929 to 1940 Mr. Smiddy served successively as assistant to executive vice-president, head of the sales department, operating sponsor for the south central companies and head of the operating section of Ebasco Services and its predecessor management organization of Electric Bond & Share. Previously he had spent one year with the Public Service Electric Co. of New Jersey and eight years with the West Penn Power Co.

▶ RAY W. MURPHY, formerly Pacific Coast district manager of the Westinghouse Lamp Division, has been appointed manager of sales promotion at the division's executive offices in Bloomfield, N. J. In his new position Mr. Murphy will work on the development

Check ✓ These ADVANTAGES Secured By the Use of *Nicopress* DEAD-ENDS

OFFSET TYPE

- ✓ Nicopress Offset Dead-Ends are designed for use on distribution lines. They can be installed with pin, strain or spool insulators and are available for copper, copperweld and steel wires.
- ✓ Any lineman can quickly make neat installations without danger of damage to conductors.
- ✓ The completed connections are so tight that the wires cannot pull out and have a strength equal to the rated breaking strength of the conductors.
- ✓ Provision is made for a tail of any desired length.
- ✓ They are designed and manufactured to withstand the strains of vibration.



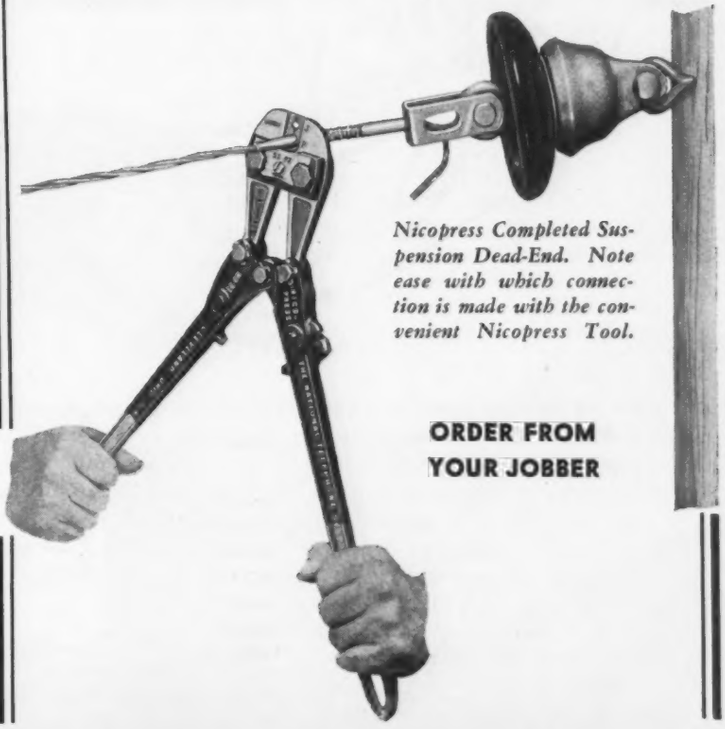
OFFSET DEAD-END

Installed on STRAIN INSULATOR

Installed on SPOOL INSULATOR

SUSPENSION TYPE

- ✓ Strongly made and assembled in one unit, for ease, speed and convenience in installation, Nicopress SUSPENSION DEAD-ENDS are designed for use with disc insulators on both high and low voltage distribution lines.
- ✓ In making the connections the conductors go *straight thru the dead-end sleeve without distortion or bending.* This feature adds greatly to the strength of the terminations and increases to a remarkable degree their power to withstand vibration.
- ✓ Provision is made for a tail of any desired length for making jumper connections or tap-offs.
- ✓ Completed Suspension Dead-Ends equal or exceed the rated breaking strength of the conductors.
- ✓ Both Offset and Suspension Dead-Ends are compressed with the same tool used in making regular line splices.



Nicopress Completed Suspension Dead-End. Note ease with which connection is made with the convenient Nicopress Tool.

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THE NATIONAL TELEPHONE SUPPLY COMPANY

Manufacturer of Specialties for Power and Communication Lines

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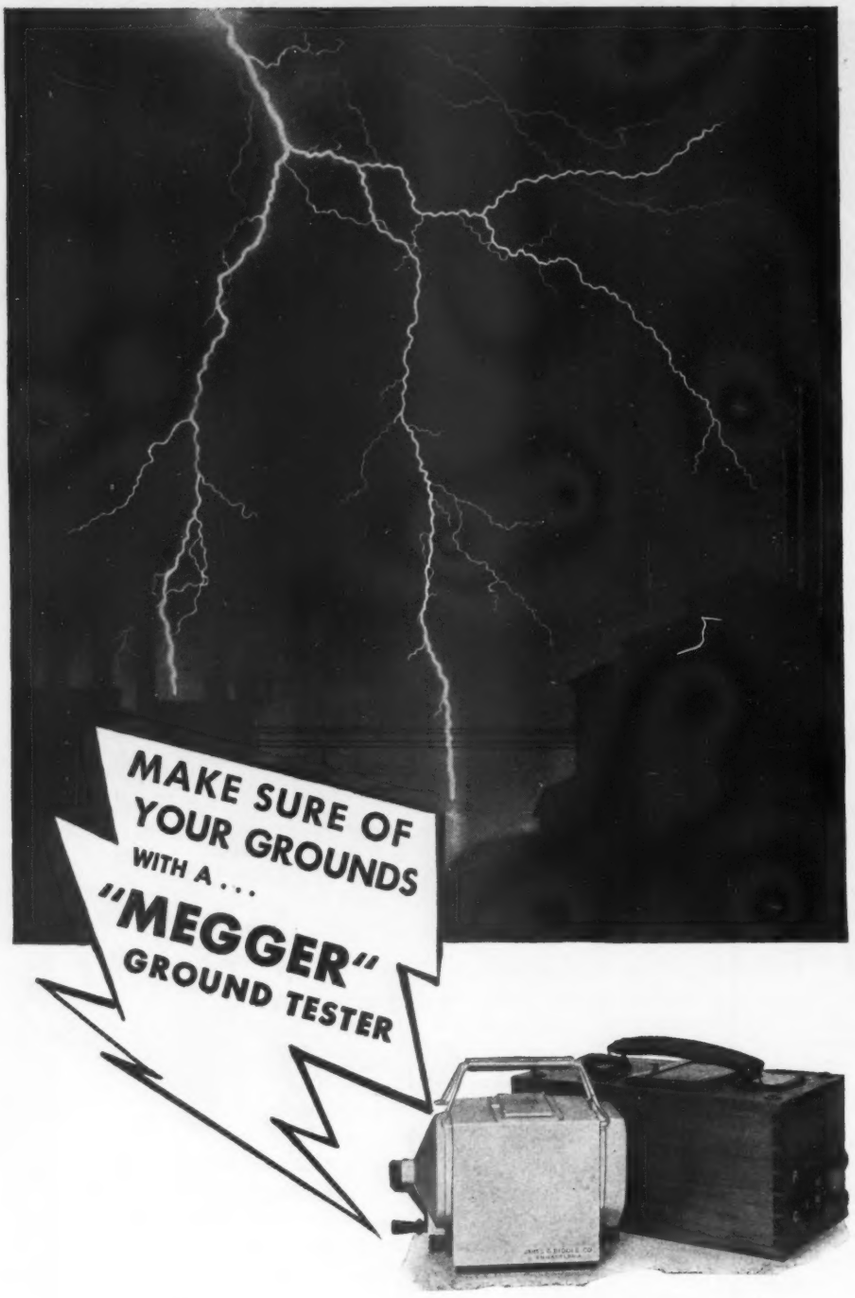
Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.



Protection to life and property and the correct functioning of nearly all types of electrical equipment depend largely on suitable and permanent ground connections—connections that are maintained in a condition to perform the service for which they were designed and installed.

Make sure that your grounds have adequately-low resistance through the periodic use of a "Megger" Ground Tester. These instruments provide a method that is simple, quick and accurate—proved by their acceptance and years of service throughout industry.

★

If you are in need of a really good ground testing instrument, we suggest that you write us immediately. Catalog 1645-W.

James G. Biddle Co.

1211-13 ARCH STREET *Electrical and Scientific Instruments* PHILADELPHIA, PA.

of plans to meet today's changing conditions and in the formulation of programs for post-war activities. Born in California, Mr. Murphy has been with Westinghouse since 1909 and has served in various capacities on both east and west coasts. In 1920 he became manager of the Pacific Coast district in San Francisco, the position he held at the time of his present appointment.

•

D. G. Mitchell to Direct Sales for Sylvania

Don G. Mitchell has been appointed vice-president in charge of sales of Sylvania Electric Products, Inc. This is a

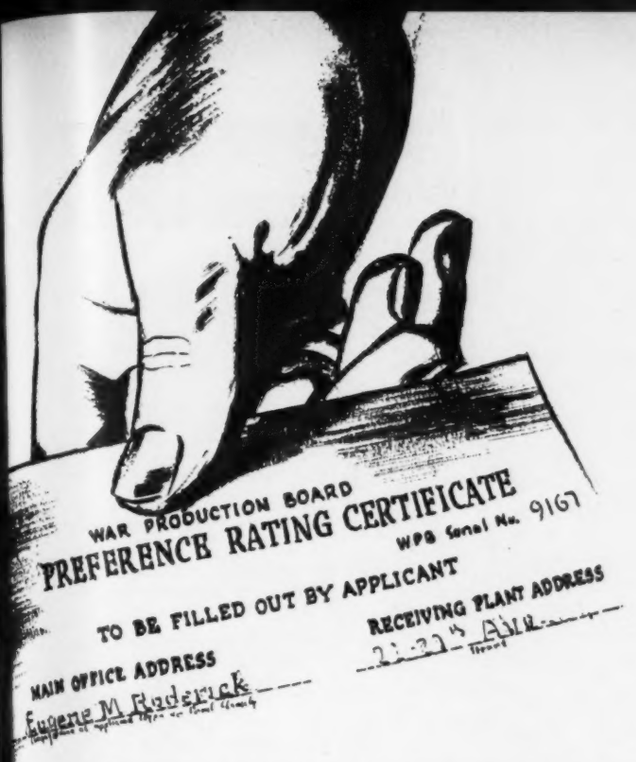
new office established to plan and direct the distribution and merchandising of all Sylvania products.

Mr. Mitchell was formerly connected with the American Can Co. and more recently with the Pepsi-Cola Co. as vice-president in charge of sales.

•

▶ A. E. HITCHNER, formerly manager of the Los Angeles office of the Westinghouse Electric & Manufacturing Co., has been appointed assistant to the manager of the company's industry sales departments with headquarters at the East Pittsburgh works. Mr. Hitchner is a past-president of the Pacific Coast Electrical Association.

▶ C. E. HICKEY, formerly manager distribution operation department, Consolidated Edison Co. of New York, Inc., has been appointed manager of the newly created outside plant construction department. He has been employed continuously by Consolidated Edison and allied companies since 1904. J. E. GALLAGHER, formerly general superintendent, station construction and shops, has been transferred as general superintendent to the department of electrical construction. He formerly was con-



Here is your *right* to buy

—and here is the way to make it easier

You've just landed that big war order. It's a huge one . . . it will keep your plant humming for some time to come.

Your problem now is how to meet that deadline.

There are some changes necessary on your equipment. . . . Like explosion-proof motors, for instance. You know that the inflammability of the product you will manufacture will not permit the use of motors that spark.

You are familiar with several companies that make and sell motors. . . . But do they have motors for hazardous locations?

Here's an easy answer.

Reach for the *Electrical Buyers Reference*. . . . Turn to the heading "MOTORS" in the Directory Section. Under the twenty different motor classifications you quickly locate "Motors — Hazardous Locations." Six of the manufacturers are in bold face type, with a page number referring you to the BRIEFALOG* Section in the front of the book, where you find detailed catalog data giving the information you need to compare, specify and buy.

This is one of the many ways E-B-R can save you trouble.

Old timers habitually use E-B-R BRIEFALOGS for their buying and specifying of electrical products.

Newcomers in the field will find the BRIEFALOGS a speedy means of reaching a purchasing decision.

* Briefalog: The modern method of cataloging—with condensed descriptions and specifications on all products plus branch office, distributor and warehouse addresses for quick follow through.

ELECTRICAL BUYERS REFERENCE

A McGraw-Hill Service

330 WEST 42nd STREET NEW YORK

Tips voltage tested all wood hoods—are safer than rubber

These all wooden insulator and conductor hoods not only take the place of rubber, but provide better insulation protection. They can be safely recommended for use on voltages up to and including 22 KV, which greatly surpasses the maximum recommendations previously established for rubber hoods.

A special tongue and groove arrangement permits the insulator hood to interlock over the end of the conductor hood and prevents these units from coming apart. All joints are made secure by wooden pins and sealed with a special animal glue. Hoods are treated with the same preservative used for hot line tools.

The illustration above shows a lineman using a new fork-like tool for applying the insulator hood from a safe and convenient position. One of these small tools will fit all hoods.

Hoods are made for double or single arm construction having one or two insulators of, not to exceed 9" in diameter.

nected with the Brooklyn (N. Y.) Edison Co. G. C. BAKER, engineer of estimates, contract control and inspection department, has been made superintendent of estimates and orders. E. E. HILL, formerly general superintendent, distribution construction bureau, has been transferred as manager of the distribution operation department. He first joined the company in 1904 as assistant meter tester, New York Edison Co.

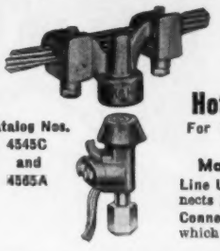
► RAY INGHAM, for many years general superintendent of the Iowa Electric Co. and the Central States Electric Co., was named vice-president at the last meeting of the board of directors. He will continue as general superintendent of the Iowa properties in addition to his new duties. Mr. Ingham has been associated with the Cedar Rapids companies for 30 years. He began his career in the industry as a lineman with the old Iowa Railway & Light Co., later becoming construction foreman, general foreman and finally general superintendent. Mr. Ingham succeeds S. C. Dows, who became president of the four affiliated Iowa utilities following the death of I. B. Smith in 1941.

► JAMES P. JACKSON has been appointed chief accountant of the Associated Gas & Electric Corp., succeeding H. A. BLOOMQUIST, who has resigned to enter military service. Mr. Jackson was formerly accountant in charge of original cost matters for Associated. Earlier in his career, Mr. Jackson served as assistant chief accountant of the Federal Power Commission, accountant examiner for the Pennsylvania Public Utility Commission, treasurer of the South American Public Service Co. in Buenos Aires, Argentina, and accountant and auditor for Gannett, Seelye, & Fleming, consulting engineers.

► R. H. LUEBBE has been appointed assistant manager of the General Electric Co.'s appliance and merchandise department. He will be responsible for all legal matters pertaining to the department and will perform such administrative duties as may be assigned. Mr. Luebbe became identified with the law department of General Electric at Schenectady in 1928. In 1937 he transferred to the appliance and merchandise department and three years later was appointed assistant general counsel of the company, in which capacity he moved to Schenectady. In taking over his new duties Mr. Luebbe moved to Bridgeport.

► OTTO A. KNOPP has retired as chief of Pacific Gas & Electric Co.'s bureau of tests and inspections at Emeryville, Calif., following almost 40 years service with that company. He is succeeded by W. N. LINDBLAD. Mr. Knopp wrote

A Live Wire is no better than its Connections



K & H

Hot Line Clamps

For Copper and Aluminum Lines

Catalog Nos. 4545C and 4565A

Made in Two Parts

Line Unit—The part that connects permanently to the line.

Connector Unit—The part to which tap wire is attached.

These clamps are designed to overcome three objectionable features encountered in making hot line connections in the past, viz.:

1—To eliminate arcing or crushing of line while connecting or disconnecting tap wire.

2—To prevent atmospheric corrosion rendering threads useless.

3—To forestall mechanical failure caused by ice and sleet.

HOT LINE STICK ADAPTER

Quickly and easily attached to any Standard Hot Line Stick

Catalog No. HLA2

★ WRITE FOR BULLETIN 11-A ★

K&H KRUEGER & HUDEPOHL

Solderless Terminal Lugs and Connectors

S. E. VINE AT THIRD • CINCINNATI, OHIO

Natvar

VARNISHED CLOTH AND TAPE

Straight Cut and Bias Cut

BLACK AND YELLOW

- High Quality
- Long Life

Supplied in all commercial sizes, in accordance with standard and special specifications.

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PROMPT SERVICE! QUICK DELIVERIES!

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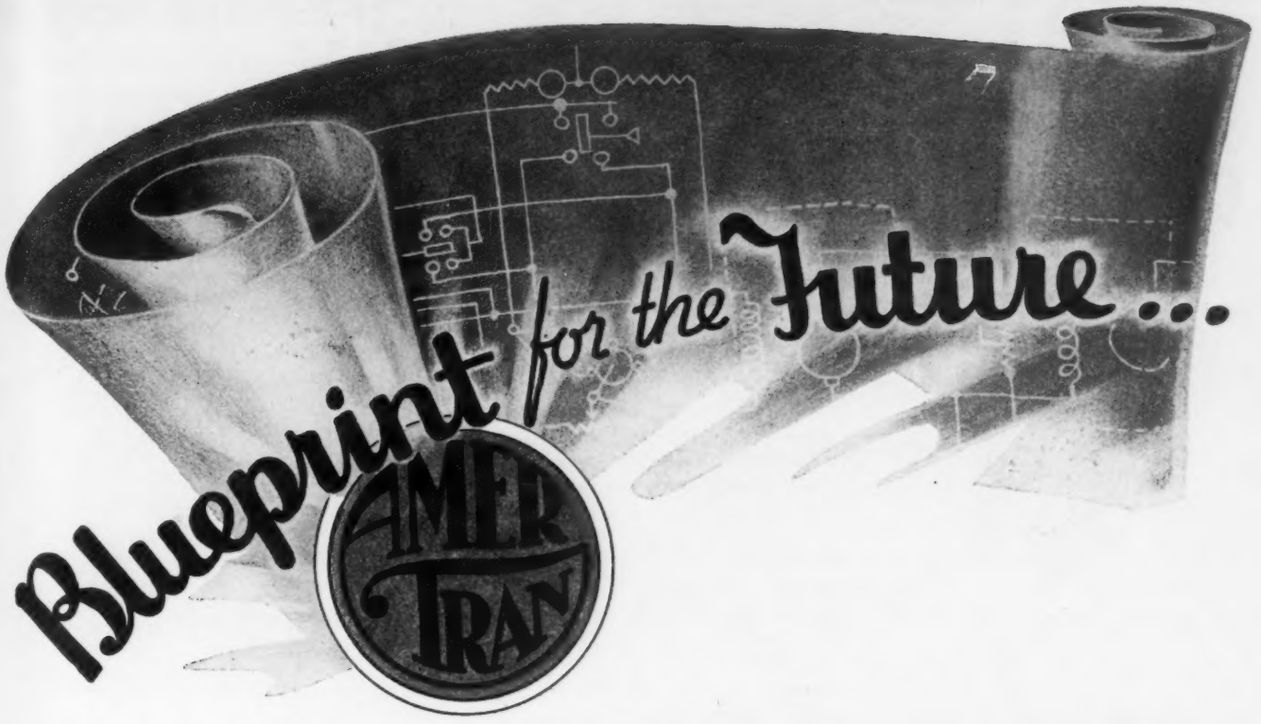
THE NATIONAL VARNISHED PRODUCTS CORP.

211 Randolph Avenue, Woodbridge, New Jersey



Serving America's War Work Now... the better to serve all American Industry later

AmerTran power transformers available for all requirements in sizes to 10,000 KVA, 132 KV.

AmerTran distribution transformers of either oil- or noninflammable-liquid-immersed type available in sizes to 500 KVA, 72 KV.

AmerTran air-cooled transformers for either indoor or outdoor service are available for all industrial requirements—sizes to 150 KVA.

Here in AmerTran's factories under the accelerated tempo of war production, we are designing and building better transformers that will help meet the competitive conditions of the general business upswing of the future. Here in blueprint form, and in the shape of refined designs and improved construction, better AmerTran equipment is being produced to serve war-time America now . . . to serve peace-time industry later. Tomorrow these improvements will be available to the whole of the electrical field for all industrial and utility applications. The confidence you have placed in the AmerTran pre-war products you are using today—a confidence merited by 41 years of leadership—will be many times justified when the splendid results of the work AmerTran is doing today become generally available to a victorious American industry.

AMERICAN TRANSFORMER COMPANY, 178 Emmet St., Newark, N. J.

Manufactured Since 1901 at Newark, N. J.

AmerTran transformers are manufactured to meet your exact electrical and mechanical requirements.

AMERTRAN

RELIABLE Connectors

Save Time by using solderless connectors with accurately fitting precision threads which insure easy, permanent installations.

Save Copper by using these connectors which are good as new after being salvaged.

EASY TO INSTALL
LOW IN COST

Reliable
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
[illegible] CARROLL AVENUE • CHICAGO ILLINOIS

numerous articles and made several developments in meters and measurements during his years with the utility.

He is a charter member of the San Francisco chapter of the American Institute of Electrical Engineers. Mr. Lindblad has been with Pacific Gas & Electric since his graduation from college in 1913. Following a year in the meter department, he was transferred to the laboratory, where he has been since, with the exception of a year in the Aviation Corps in World War One.

▶ EDGAR N. PATTERSON, superintendent of operations in the central division of the distribution department of the Duquesne Light Co., has retired after more than 49 years of continuous service. Mr. Patterson started in the public utility industry at the age of sixteen with the Chartiers Valley Light & Power Co. in Carnegie, Pa., doing power station work. The following year he joined the old Southern Light, Heat & Power Co., one of the predecessor companies of Duquesne Light, which was organized in 1903. In 1911 he was made district superintendent of the Rankin district and in 1929, when the distribution department was reorganized, he was appointed superintendent of operations in the central division, the position he held until his retirement.

OBITUARY

Joseph F. Porter

Joseph F. Porter, chairman of the board of the Kansas City Power & Light Co., Kansas City, Mo., died in that city on November 7, in his eightieth year.

Mr. Porter devoted his entire life to public utility work or some of the affiliated industries. He became president of the Kansas City utility in 1917, serving in that capacity until 1938, when he was named chairman of the board. Mr. Porter was born in Woodbine, Iowa, in 1863 and received his engineering education at Iowa State College, from which he was graduated in 1884.

•

▶ WALTON F. STOVER, 67, for 17 years general superintendent of the municipal light and water plants at Linton, Ind., died recently.

▶ SAMUEL E. MULHOLLAND, who retired in 1935 as vice-president and general manager of the Indiana Service Corp., Ft. Wayne, died recently at his home in that city, in his seventy-seventh year. When Mr. Mulholland retired he had completed forty years of continuous service in the utility field.

Get the right answer *FAST*—for more efficient more profitable handling of

EVERY TYPE OF PRACTICAL ELECTRICAL JOB

Thousands of men have used previous editions of this famous handbook as a working guide of everyday usefulness. Now it is ready to help you too, in a big new 5th edition—600 pages larger—brought up to date — *more than ever the one great pocketbook of practical electricity for you.*

Just Published—New 5th Edition

Croft's AMERICAN ELECTRICIANS' HANDBOOK

Revised by CLIFFORD C. CARR
Head of Electrical Engineering Department, Pratt Institute

THIS book is packed from cover to cover with the facts which every man engaged in electrical work needs to have constantly at hand. From clear explanation of the fundamentals of electricity, to suggestions for remedying the troubles of electrical equipment, the information is the kind that helps practical electrical men select and install commercial electrical apparatus and materials intelligently for the performance of specific services, operate electrical equipment efficiently, and maintain it at high operating efficiency.

1600 PAGES OF practical data, helpful pointers, explanatory illustrations and diagrams, useful rules, recommendations, and short cuts, and much descriptive information on modern electrical practice. 5 x 7½, 1177 illustrations.

PRICE ONLY $5.00

COVERS:
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Send me Croft's American Electricians' Handbook for 10 days' examination on approval. In 10 days I will send $5.00 plus few cents postage, or return book postpaid. (Postage paid on cash orders. Same return privilege.)

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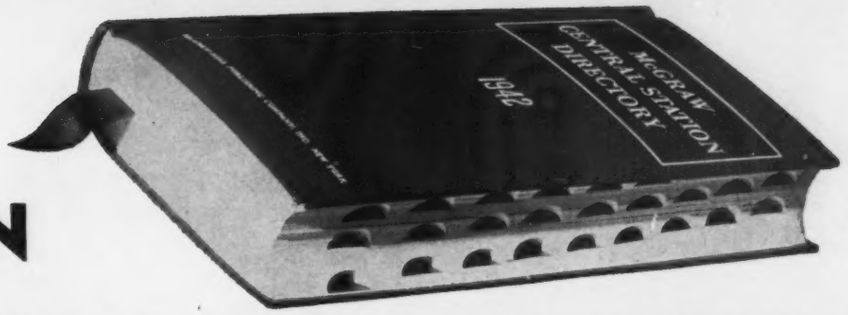
THE 1942 EDITION



McGRAW CENTRAL STATION DIRECTORY

Here's the book that gives you the latest changes in the utility field . . . it saves you time, travel and needless expense . . . assures correct contacts for priority orders

CONTENTS OF THIS HANDY, STURDILY-BOUND VOLUME

Names and addresses of independently owned and municipally operated electric light and power companies in the United States, Canada and U. S. Possessions; also, government controlled projects, State Commissions, and National and State Associations.

Names and addresses of affiliated, holding, controlling or managing and service companies with complete lists of properties controlled or managed by each, and including names and addresses of principal officials.

Names and addresses of officials and chief operating men for all operating companies.

For each operating company, the following information is presented:

Company total and Plant individual generating Capacity in kva. or kw.

Kind of Prime Mover and Capacity in hp.

Amount of power purchased in kw. hrs.

Type of current distributed, No. of wires, phase, voltage and cycle.

Circuit Miles Underground—duct distribution.

No. of meters served.

Location of power plants.

Location of districts or divisions.

Complete list of towns (of 500 Population or over) served.

Complete alphabetical index of companies listed.

NEARLY 900 PAGES

- *Sturdily bound in flexible blue Fabrikoid.*
- *Fully thumb-indexed.*
- *Size, 4½ inches by 8½ inches—easy to carry, handle and use.*
- *Published annually.*
- *Price, $25.00 per Copy—10% discount on 5 or more copies.*

If the electric utility market is part of your picture, you can't afford to be without this new 1942 McGraw Central Station Directory. For there have been changes in the utility field during the past year—plenty!

Personnel has been changed . . . key men have been shifted . . . new power plants have been built to meet unprecedented load demands. The McGraw Central Station Directory supplies all the essential facts concerning these changes plus other complete, up-to-date information, in a form easy to use.

With manufacturers' sales forces decreased and new buyers and buying influences in the picture, this directory is an indispensable aid in providing vital information for new sales approaches.

How Hundreds Are Now Using This Directory

Manufacturers of Electrical Generating, Transmission and Distribution Equipment:

To secure names and addresses of utility officials, determination of important utility operating data and scope of utilities' operation.

Manufacturers of General Equipment and Supplies:

To secure names and addresses of utility plant officials, engineers, and purchasing agents, and determination of probable purchasing power for utility requirements.

Electrical Utilities:

To know organizational structure of other utilities, to keep posted on movements of utility officials and to size up discernible trends in expansion of operations.

Financial Houses, Consulting and Contracting Engineers, Commissions and Others:

To keep posted on changes in utility personnel, to know the organizational structure of every company and to secure a complete picture of each company's scope and operating data.

SEND TODAY FOR YOUR COPY OF THIS VALUABLE GUIDE TO UTILITY RELATIONS

McGRAW-HILL PUBLISHING COMPANY

CATALOG & DIRECTORY DIVISION • 330 WEST 42nd ST., NEW YORK, N. Y.

MANUFACTURING-MARKETS

Allis-Chalmers Net Off in 3d Quarter

Allis-Chalmers Manufacturing Co. reports, for the third quarter of 1942, a net income of $1,017,163, or 57 cents a share on 1,776,092 no par shares of common stock outstanding at the close of September, after provision of $6,700,000 for federal income and excess profits taxes. The net income for the third quarter of 1941 was $1,781,216, or $1.00 a share, after providing $3,000,000 for federal income taxes.

Billings amounted to $55,732,642 and bookings, $55,717,119 in the third quarter, which compare with billings of $37,091,112 and bookings of $44,478,497 in the 1941 third quarter.

For the nine months of 1942 the net income was $3,104,649, or $1.75 a share after provision of $17,804,000 for federal income and excess profits taxes, as compared with $4,170,793, or $2.35 a share, in the similar period of 1941 after providing $4,765,000 for federal income taxes. Billings for the nine months were $143,923,003 as compared with $86,089,812 in the corresponding period of last year, an increase of 67 percent. Orders booked for the nine months amounted to $148,368,574, or 15 percent over the $128,867,055 bookings in the same period of 1941. Unfilled orders on hand September 30, 1942, totalled $129,457,129 as compared with $125,011,558 at the close of 1941.

•

Silex Line Expands

The Silex Co., Hartford, Conn., has declared a dividend of 25 cents per share paid on November 10 to stockholders of record October 31. Recent quarterly distributions have been at the rate of 30 cents per share, but the directors felt that the above deduction should be made at this time in the face of taxation prospects. Frank E. Wolcott, president, stated recently that the company's sales volume is expected to rise substantially as a result of the development of new lines of glass coffee making equipment. Full-scale production is anticipated this month.

•

Westinghouse Plant Sets War Record in October

Announcing that war production at the giant East Pittsburgh works of the Westinghouse Electric & Manufacturing Co. rose to a new high during October, Vice-President A. C. Streamer credited "close co-operation between labor and management" with making the achievement possible.

More than 1,300 carloads of equipment for the armed forces and for other war plants were shipped during the month, Mr. Streamer said, an increase of more than 5 percent over September.

Big War Output Is Predicted by G.E.

Production of $1,000,000,000 in war goods this year by General Electric Co. is forecast by the management in a booklet, "General Electric Goes to War," sent to the company's stockholders.

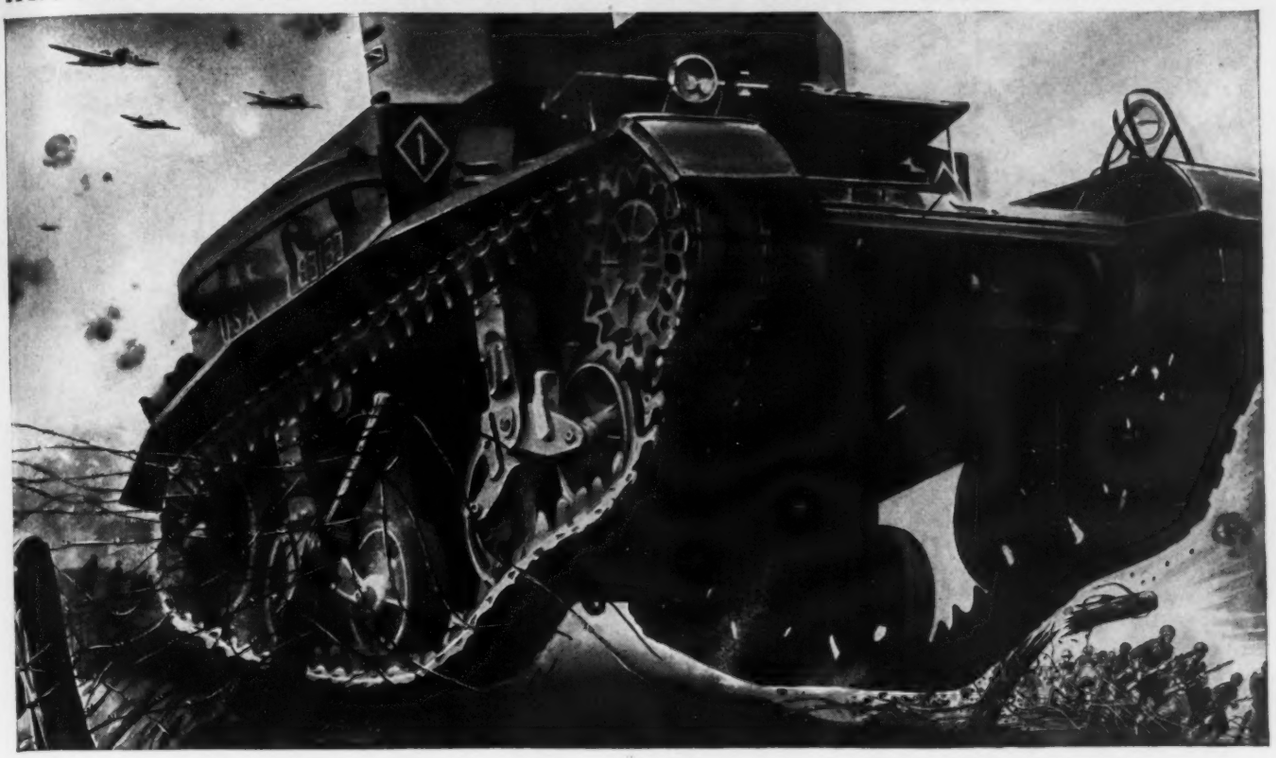
How the company has vastly expanded its plants, hired and trained thousands of new workers, converted facilities to war, used subcontractors and other war developments are described.

"In the two years 1940 and 1941," the booklet reports, "$48,100,000 had been spent on new facilities for war projects completed or under construction, and the eventual total cost was estimated to be $154,700,000."

"Of this amount, $46,700,000 has been or will be financed by General Electric; the remainder of the cost is

SUGGESTION EXPERTS—More than 125,000 pounds of steel and 8,000 man-hours of labor will be saved by General Electric because of the ingenuity of the four war workers above, shown with B. G. Tang, general superintendent (seated). The four men headed a group of 60 plant employees who received awards totaling $1,575 in a single week for suggestions to speed war production. Left to right—A. Campriello, S. Frederick, H. Wildman and D. Belott. The company has paid out about $100,000 this year for 11,000 suggestions adopted

AN ELECTRICAL WHOLESALER HELPS SPEED WAR PRODUCTION



WESCO skill helped tanks roll 58 days quicker

Special Heating Oven Designed, Wired and At Work for Tank Builder in 48 Hours

A Texas Army tank builder needed—double quick—an oven to heat-treat big Diesel Engine connecting rods—300 lbs. at a time. Standard type ovens were either too small or couldn't produce required temperatures. With oven manufacturers' best delivery 60 days, tank production faced a full stop; so the builder brought his problem to the local Wesco House.

Wesco quickly designed a special oven. In 36 hours the tank foundry had built the oven body; in 10 more hours, Wesco Service men had the job completely wired, units placed, thermostatic controls installed and properly calibrated for temperature. As a climax, with only 440 volts available, Wesco ingenuity wired 220-volt elements in series for 440-volt operation. Within 48 hours after the problem was given to Wesco the special oven was in service.

Saving 58 days of costly delay in tank production typifies scores of cases of unique Wesco Service—now devoted to Victory, later to speed peacetime business.

WESCO SPEEDS PRODUCTION

* Within 19 days large quantities of various electrical supplies were delivered to a glider plant by Wesco—best complete delivery by manufacturers was 7 weeks.
* Shipment of 55 miles of conduit for war plan started within 24 hours after Wesco got the order. Best delivery from any other source was 5 weeks to start.

WESCO SERVES BUSINESS

* By warehousing stocks in anticipation of customers' needs.
* By furnishing informative and technical data.
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The name that means everything in electricity

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

for NIGHT REPAIRS *and* LINE PATROL

Linemen's Flare Lights

An efficient, economical form of portable illumination—giving daylight vision for night repairs and line patrol work. Unaffected by wind, rain or snow. Two sizes—20 or 30 minute lighting periods.

Central Linemen's Flare Lights are invaluable during outages or other emergencies when quick dependable illumination is imperative. Easily lighted in any weather by self contained friction cap. No matches required. Stick in a post, tree, cross arm, in the ground or carry by hand.

They're always ready, and provide ample illumination. Standard equipment with prominent utilities throughout the land.

STANDARD PACKING

No. 3020—20 min., per case of 72...$12.00
No. 3030—30 min., per case of 36... 9.00

Central Railway Signal Company, Inc.
272 Center Street
NEWTON, MASS.

Plant Locations: Hammond, Ind.; Needham Hts., Mass.

borne by government agencies. Broadly speaking G.E. has undertaken the financing of those projects which represent expansion of existing plants. The government is financing new plants and, in some instances, new machine tool equipment for use in company-owned buildings.

"Factory employment increased 25 percent from January 1, 1939, to July 1, 1940—before the really large war orders began to come in. During 1941 more than 34,000 new employees were added to the payrolls, and total employment is now more than 130,000."

•

Army-Navy "E" Award Made to Additional Plants

In a simple noon-day ceremony on November 4, at the company's main plant in Cleveland, Ohio, Reliance Electric & Engineering Co. received a new Navy "E" pennant which carries a star as indication of the renewal by the Navy Department of this award which was first presented Reliance six months ago.

The Army-Navy "E" award has been presented to the Hedges-Walsh-Weidner division of Combustion Engineering Co., Inc. The presentation was made in an out-door ceremony at the plant in Chattanooga, Tenn. The company is a recent recipient of the Maritime Commission's "M" award.

Included in a list of winners of the joint Army-Navy production award recently issued were the Emerson Electric, booster plant, St. Louis; Colt's Patent Fire Arms Manufacturing Co., Park Street, Flower Street and Van Dyke Avenue plants, and Lapp Insulator Co., Le Roy, N. Y.

•

Sturtevant Opens New Plant in Illinois

W. B. Sturtevant Co., Hyde Park, Boston, has announced the opening of a new branch plant at LaSalle, Ill. This new plant will serve as the company's mid-west production center, superseding the factory at Sturtevant, Wis., which has been closed.

In addition to the main plant at Hyde Park, the company also operates other branch plants at Berkeley, Calif.; Camden, N. J., and Galt, Ontario.

•

Kidde Buys Two Plants

Walter Kidde & Co., Inc., Bloomfield, N. J., have purchased the Rice Bakery in Newark and East Orange, N. J., thus acquiring 57,000 sq.ft. of additional floor space.

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

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Good advertising speeds information from those who have it . . . to those who need it.

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McGraw-Hill Publishing Company, Inc.
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Field Reports on Business

With the national economy geared to meet the demands of total war, business activity continues to expand. Heavy industries are operating at or near peak levels, while retail trade is showing substantial gains over last year. Factory alterations are calling for a wide variety of electrical supplies.

NEW YORK

Utility stock and bond price averages moved up slightly last week, compared to the previous week; utility stocks averaged 35.8, as against 34.8 the week previous and 32.4 a month ago. Bonds averaged 107.8 for the past week, as against 107.1 the week previous and 106.6 a month ago.

Department store sales continued at an increased pace, with a country-wide increase of 14 percent registered for the week ended October 31, compared to the corresponding week in 1941, according to the Federal Reserve Board figures. New York's gain was 17 percent, Boston's 11 and Philadelphia's 8. The public's rush to buy remaining stocks of durable goods before inventory controls and shortages remove them from the market was chiefly responsible for the gains.

Engineering construction volume for the short week due to the Election Day holiday totaled $137,412,000, more than triple the volume for the 1941 corresponding week and above the $103,282,000 reported for the preceding week, according to *Engineering News-Record*. The same source released the figures for the month of October, which showed a total of $691,979,000—an average of $138,396,000 for each of the five weeks of the month. The figure represents a gain of 70 percent over the 1941 October but a 22 percent loss over the month of September. The latest week's volume, incidentally, brings the 1942 total to $8,461,997,000, an increase of 60 percent over the 45-week period of 1941.

NEW ENGLAND

New England industries are paring down their backlogs of war orders in maintaining a record-breaking pace in activity. Plant additions recently authorized by the Defense Plant Corporation include $250,000 in equipment for General Electric plants in Connecticut and Indiana and $750,000 for the Sprague Specialties Co., North Adams, Mass. Important contracts which will lead to increasing power supply in this area include a $250,000 power line tunnel for a prominent utility and a duct line, unspecified amount, for an important Massachusetts plant. Wiring supplies for power and light will be required in a new laboratory for western Massachusetts to cost in the neighborhood of $30,000 and in a $150,000 addition to Lynn hospital facilities made necessary by the mounting war effort in that area.

About 2,000 kva. in capacitors has been installed recently in six leading industrial establishments in the Narragansett Electric system in the Providence, R. I., area. A 66-kv. wooden pole transmission line about 15 miles long is under construction in eastern New England for military use. A Connecticut manufacturer has received an order for ten gasoline-driven motor-generators and five electric centrifuges have been sold by the International Equipment Co., Boston. Wire and electric cable orders are being booked at a steady rate. Distribution transformers, small generator sets and panelboard equipment are in demand.

Active bidding is noted on electric heating pots, water heaters, small electric hoists, and switch materials by manufacturers. Some factory changes and small additions in the greater Boston area are going on with a fair-sized amount of alteration work carrying some demand for changes in lighting. Lessening sales of new construction electrical supplies may loom ahead in view of the cancellation of projected housing plans in this area by the Federal Public Housing Authority, which has suspended further action of projects involving 1,138 permanent units.

PACIFIC COAST

Central station machinery business has improved over a quiet summer and includes low bids of $25,770 by Allis-Chalmers on instrument transformers for Ampere substation in Washington, $60,030 for six 15-kv. circuit breakers for Mead substation in Bonneville System, $10,394 for instrument and current transformers for Colfax station in Washington and $27,762 by Westinghouse for 18 lightning arresters. There were recently shipped to Hawaiian Islands 105 transformers, sizes 5 to 100 kva., value $45,000.

Recent industrial developments include a 50-ton tungsten concentrating plant for Lincoln County, Nev.; a 65-mile, 69-kv. line to connect the Bagdad Copper Corp. with Parker power plant; a railroad, costing $24,000,000 to be built southward from Arizona into Mexico; a 100-octane Sinclair refinery in Wyoming.

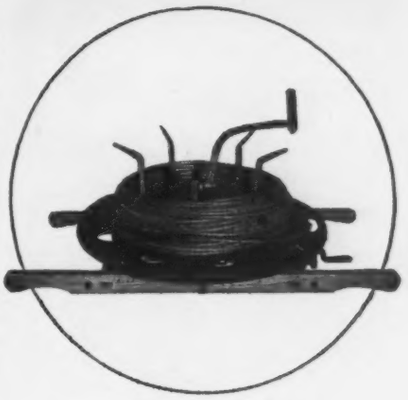
Farm electrical requirements are seriously hampered by farm machinery and wiring material shortages, and the recent high average of 90 percent acceptance of electrical service applications is now near 70 percent, with A-I-J priority replacing the former Farm A-2. Hospitals, always rating high electrically, have become a major item in war construction, including installations averaging $400,000 for Burbank and Marysville, Calif. Salem, Ore.; Ogden, Utah, and Sitka, Alaska, besides larger groups of buildings at Renton and Seattle and $1,500,000 for Brigham City, Utah.

CHICAGO

A fresh spurt in war production orders for plants in this area was reported when the Chicago Association of Commerce disclosed that 76 new war contracts had been awarded to 53 local companies. Of these, 14 had not previously been called upon for war production. Since the start of the war production program, 1,756 concerns in the Chicago area have received 8,118 government war contracts worth $1,857,539,000. A potent factor in recent months has been the better-than-average increase in farm income. However, labor shortages threaten to limit industrial output. The over-all employment trend in the district is upward.

Retail trade last week bettered the corresponding week a year ago, but was somewhat reduced from the preceding week.

Among the DPC contracts authorized are the following: Weldon Tool Co., Cleveland, machinery and equipment in Ohio plant; Wellman Bronze & Aluminum Co., Cleveland, for additional plant facilities in Ohio. The increase will be in excess of $175,000, making total commitment of more than $625,000; Barnes-Duluth Shipbuilding Co., Duluth, for additional plant facilities.



Reel Facts.

You will pay less per annum for Matthews Adjustable Reels than you will for pay-out and take-up reels which are lower in first cost but which will not give you the long, low TIME-COST service of Matthews Adjustable Reels.

With ordinary care they should last at least 10 years. They are ruggedly built, and their several special patented features make them especially desirable and durable.

They are furnished with or without a Brake for paying out and taking up wire in coils. The Brake is especially desirable for paying out wire.

Matthews Adjustable Reels will save their cost many times over, as you can use wire in coils; thereby saving the cost of wooden spools, freight, and the bother and expense of returning spools for credit.

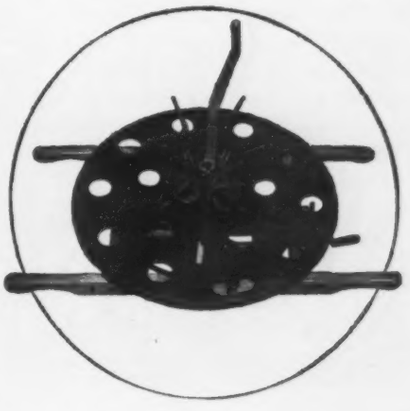
In 1928 one large power company in Ohio equipped all of their line trucks with Matthews Adjustable Reels. All these Reels are still in service, and this power company has bought many more since 1928.

This experience—which has been repeated by many users of Matthews Adjustable Reels—shows a per annum cost of less than $5.00 per Reel.

You can try them at our risk of your approval. Write for Bulletin giving all details.

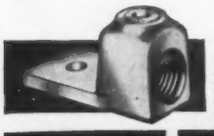
W. N. MATTHEWS CORPORATION

ST. LOUIS, U. S. A.



SAVE TIME—select your conductor fittings from this Catalog . . **ALL** good types

You can buy Tee Connectors, Grounding Clamps, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Service Connectors, Bus Supports, Terminals . . . *practically every good type, in the COMPLETE line.*



JUST FOR EXAMPLE— here are some of the standard Penn-Union Vi-tite terminal lugs:

2-bolt flange

45° flange

Side flange

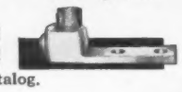
Center tongue

Round, 45°

Round, 90°

Round, offset

Round, center



These types and many more—in a *complete* range of sizes. Write for Catalog.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors. They have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

Sales Opportunities

WASHINGTON—Department of Lighting, Seattle, has approved plans for immediate construction of new switching station, including circuit breakers, disconnecting switches and accessories, and extension of 220-kv. lines.

OHIO—War Department, Washington, D. C., has authorized new air force base, taking over an existing municipal airfield. Electrical equipment and facilities, underground lines, power substation, electrical distribution system. Entire project will cost about $3,000,000; supervised by U. S. District Engineer Office, Wright Field, Dayton.

NEW YORK—Republic Steel Corp., Republic Bldg., Cleveland, Ohio, will carry out two plant expansions with machinery to cost over $1,050,000, including electrical equipment and facilities, power substation apparatus, etc. Financing through Defense Plant Corp.

MARYLAND—Baltimore Transit Co., Equitable Bldg., Baltimore, has plans nearing completion for new substation. Addison F. Worthington, 14 East Hamilton Street, Baltimore, is architect.

FLORIDA—Navy Department, Washington, D. C., plans new major airport with complete lighting system, underground conduit, switching station and control. Also electrical equipment and facilities for shop and other industrial service. Cost, $750,000. Work to begin soon.

INDIANA—Public Service Co. of Indiana, Indianapolis, plans expansion in steam-electric generating station, including new multi-story addition for extensions in turbine and steam departments. Building erection let to J. L. Simmons Co., Indianapolis. Cost estimated $500,000. Sargent & Lundy, Inc., 140 South Dearborn Street, Chicago, is consulting engineer.

NORTH CAROLINA — War Department, Washington, D. C., plans new air force base. Electrical equipment for lighting and power service, power substation, distribution system. Cost over $2,000,000; supervised by U. S. District Engineer Office, Wilmington.

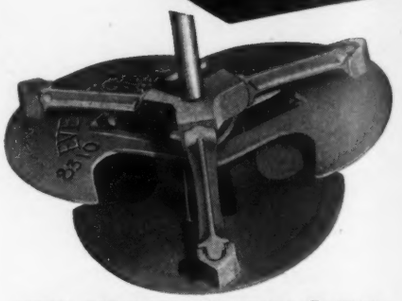
LOUISIANA—Higgins Industries, Inc., 521 City Park Ave., New Orleans, plans large industrial plant for construction of cargo-type aircraft, marine engines, etc. Complete electrical equipment and facilities will be installed, including cranes and mechanical-handling apparatus. Power plant will be enlarged, with additional transformer stations in various plant areas; motor-generator sets and control facilities will be installed. Entire project is reported to cost over $20,000,000, with financing by Defense Plant Corp.

CONNECTICUT—New York, New Haven & Hartford Railroad, New Haven, plans expansion of steam-electric generating station, with installation of new high-pressure boiler unit and auxiliary equipment. Cost estimated $500,000. Work scheduled to begin soon. Gibbs & Hill, Inc., Pennsylvania Station, New York, N. Y., is consulting engineer.

NORTH DAKOTA—State Board of Education, Bismarck, plans improvements in power plant at Minot Teachers' College, Minot, including installation of new electric generator and auxiliary equipment. Appropriation in forthcoming budget of legislature. Estimates being made.

OREGON—War Department, Washington, D. C., plans air force base. Electrical equip-

First CHOICE IN ANCHORS



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For dependable anchoring under all conditions, use Eversticks. Made of tough, rust-resistant, malleable iron . . . quick and easy to install . . . expand in undisturbed earth. Preferred by engineers and crews alike. Write for latest Everstick bulletin.

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ment, underground lines, power substation, electrical distribution system. Cost over $2,000,000.

INDIANA—Jones & Laughlin Steel Corp., Pittsburgh, Pa., plans steam-electric power plant at new steel mill, tract over 150 acres. Cost about $20,000,000; financed by Defense Plant Corp. Shaw, Naess & Murphy, 80 East Jackson Blvd., Chicago, Ill., are architects.

ILLINOIS—Commonwealth Edison Co., Chicago, has initiated capacity increase and improvements in one-story indoor-type power substation. H. V. VonHolst, 140 South Dearborn Street, is architect.

TEXAS—U. S. District Engineer Office, Denison, will call for bids for installation of an automatic fire alarm system and electrified guard-watch system, with electric clocks, etc., at a government development.

OKLAHOMA—War Department, Washington, D. C., has authorized new air force base. Electrical equipment, facilities, underground lines, power substation, distribution system. Cost over $3,000,000; supervised by U. S. District Engineer Office, Tulsa.

MICHIGAN—Ford Motor Co., Dearborn, will carry out expansion in plant; additional machinery and electrical equipment and facilities. Cost about $650,000; financing through Defense Plant Corp.

LOUISIANA—Civil Aeronautics Authority, Washington, D. C., has authorized extensions in airport, including lighting, underground conduit, switching station and control apparatus. Cost about $437,600.

•

Protest Tax on Power from Outside State

Southern Kraft Corp. of Camden, Ark., and the Crossett Lumber Co., Crossett, Ark., have filed appeals in the Arkansas Supreme Court from a Pulaski Chancery Court ruling that the Arkansas Revenue Department could collect the state 2 percent sales tax on electricity and natural gas supplied the two companies from outside the state.

The companies contended that such purchases were exempt from state sales tax because the levy placed a burden on interstate commerce and impaired contracts made before the tax became effective in 1935.

•

Grays Harbor PUD Signs Bonneville Contract

Public Utility District No. 1 of Grays Harbor County, Washington, has executed a new contract with the Bonneville Power Administration for purchase of power under the revised Bonneville standard rate schedule, Administrator Paul J. Raver has announced.

The new contract permits the district to purchase a greater portion of its power requirements at Bonneville's dump power rate, thereby allowing the district to make a saving in its over-all cost of electricity.

TODAY

THE ELECTRICAL ENGINEER FACES THE SUPREME *challenge . .*

War places a grim, heavy responsibility on the electrical engineers of this Nation, for behind every step taken by our vast war industries is the need for power and more power. This constitutes a challenge which will test engineering ability, knowledge, vision and foresight. It makes attendance at this year's

POWER SHOW

even more vitally important than ever before. It becomes now, not only a privilege, but the duty of every engineer to attend this exposition, this year stripped of its peacetime frills and streamlined for war.

Engineers and executives will save valuable time in solving their problems by studying the exhibits and observing the demonstrations at this all-important Power Show.

Whether your plant is directly or indirectly connected with our war effort, come to the Power Show and see for yourself engineering's newest short cuts to the use of power for war and victory.

THE POWER SHOW WILL HELP YOU SOLVE YOUR WAR-TIME PRODUCTION AND MAINTENANCE PROBLEMS

•

This year moved to MADISON SQUARE GARDEN because the U.S. Army has taken the exhibition floors of Grand Central Palace

See how . . . hear how . . . learn how . . . at the

15th NATIONAL POWER SHOW

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING

NOV. 30–DEC. 4, 1942 – MADISON SQUARE GARDEN, N. Y.

Managed by International Exposition Co.

3065A

G.C.A.

Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
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Send for Catalogue

We have been making safety tools for 26 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

HIGH GRADE HARD PORCELAIN FOR Electrical Specialties

High and Low Voltages

IMPERIAL PORCELAIN WORKS
TRENTON, NEW JERSEY

The Real way

to handle reels . . . .

Use Simplex Cable Reel Jacks for *really* safe and fast handling of reels. Pay out or take up cable faster and with less damage to the reels. They're under control at all times—no crushed toes—no "run-aways."

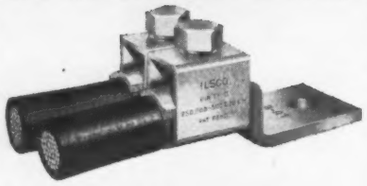
- **Lever Type for Speed**
- **Screw Type for Economy**

Thirteen models from which to choose. No. 322 shown lifts on both upward and downward stroke of over bar. Laminated oak "T" base with adjustable tie rods makes them ideal for use on rough ground. Made in pairs for use as shown (322-L and 332-R). See these and other jacks for utilities and electrical contractors in Bulletin U42.

Templeton, Kenly & Co.
Chicago, Ill.
Better, Safer Jacks Since 1899

Simplex
LEVER - SCREW - HYDRAULIC
Jacks

ILSCO
Electrical Connectors



New **MULTIPLE CONNECTORS**

MODEL LU4 for wires from 0 to 350,000 c.m.

MODEL LU6 for wires from 250,000 to 500,000

SIMPLE in design with ample contact area for sustained overloads. Make a neat installation of maximum efficiency. No special tools required.

MAIL THIS COUPON TODAY

Pure copper of highest conductivity.

Please send details and new 32-page illustrated catalog.

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COPPER TUBE & PRODUCTS, INC.

LETTER TO THE EDITOR

Utility Machine Shop War Work

To the Editor of ELECTRICAL WORLD:

Your editorial entitled "Utility Machine Shop War Work" (October 17, 1942) appealed very much to our management and we felt you would be interested in publishing our experience as your editorial outlined in general.

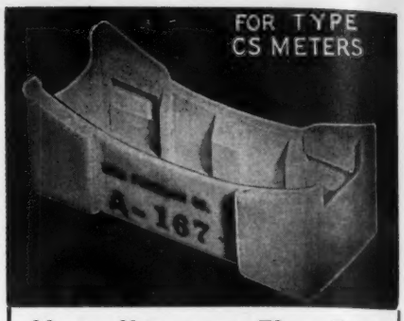
Public utilities operating machine shops for maintenance and repairs to their power apparatus can lend a helping hand to the war effort by obtaining subcontracts from prime contractors for war equipment parts.

We, the Edison Light & Power Company, find that the local prime contractors are not interested in removing machinery from the utility maintenance shops to their own plants because they lack space and would require additional skilled labor for their operation, while, in the large majority of cases, the utilities have skilled operators available. The average operator of a maintenance shop feels that his machine tool or tools are not accurate to the tolerances required for precision work. This is not at all true, since the average machine tool can be overhauled and made a precision machine for such work, or he may elect, as we have, to contract for parts the tolerances of which are well within the machine's accuracy.

This method of obtaining contracts to fit our machines has worked very satisfactorily in spite of the fact that our maintenance shop consists only of a 22-in. engine lathe, drill press and the necessary small tools accompanying such equipment. In addition to the above equipment there was formerly a shaper, for which we had little use. This shaper was catalogued along with all similar maintenance shop equipment by a local committee to determine the available machines for war work, if needed. From this listing a local war industry, needing a shaper, learned that we were willing to sell it if it would be used to aid the war effort.

We have been able to devote 40 man-hours per week toward the war program at satisfactory prices. The above program has worked so satisfactorily that we have recently received an additional contract for a small part which will consume the idle time of a 9-in. engine lathe located in our merchandise service repair shop.

Eighty man-hours per week in a machine shop is very small, but consider-



More Necessary Than Ever!

THE

STAR *PORCELAIN METER SEAL*

A positive protection against meter tampering. A simple, inexpensive, efficient way of stopping the power thief. To remove, it must be mutilated beyond further use.

Send for Sample

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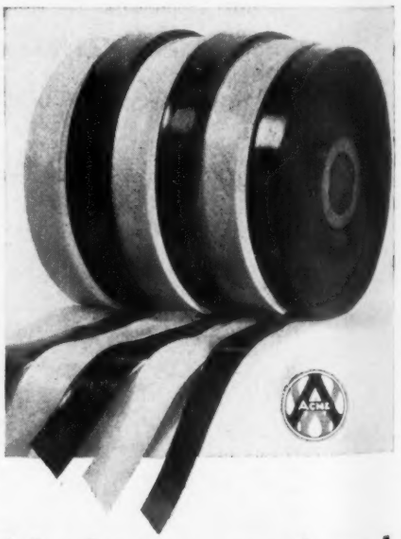
PORCELAIN CO.
51 Muirhead Ave., Trenton, N. J.



No Interruptions!

TODAY, power failures may be more than inconvenient; they may actually endanger the Nation's safety, for most defense plants stake their deliveries on uninterrupted current. Knowing that insulation is a vital link in rendering continuous service, utilities are standardizing more and more on Acme Varnished Tapes . . . nationally known for high dielectric, superior strength, and the good stretch needed for snug fits. Samples on request. Address *The Acme Wire Co., New Haven, Conn.*

Acme Wire Products
VARNISHED INSULATIONS — MAGNET WIRE COILS

ing the large number of maintenance shops over the country with not only one machine tool but several, this figure can be multiplied several thousand times and thus become a real factor in helping to produce the necessary parts for war equipment.

Further salvage of much-needed resources can be realized under this plan as an aid to war production. The operator on our contract was one of our former maintenance employees, but now pensioned, whose stamina and agility perhaps would not be adequate for the exacting requirements of continuous line production work, but who is quite capable for the class of work and conditions under which he is now operating.

In contracting for this work we had no endeavor to make it a profitable venture, but so far our experience has been that we have met all our costs of operation from the price established by the prime contractor.

C. E. STEES,
New Business Manager,
Edison Light & Power Co., York, Pa.

•

Recent Rate News

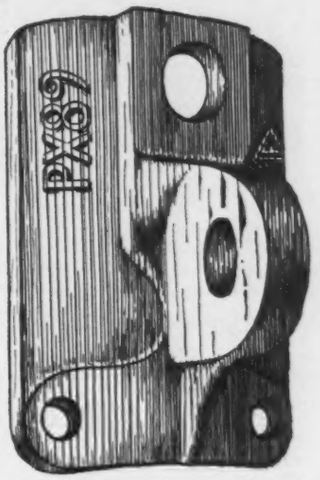
NORTHAMPTON ELECTRIC LIGHTING CO. rate case was terminated recently when the Massachusetts Department of Public Utilities dismissed the rate reduction proceedings, following a request by the petitioner, Mayor W. W. O'Connell to this effect. The Mayor stated that after studying comparative figures of operation presented by the utility for the first eight months of 1942 and for the same months of 1941, he is of the opinion that "this is an inappropriate time to proceed with the hearing."

PENNSYLVANIA POWER & LIGHT CO. has withdrawn proposed increased electric rates for 1,600 commercial and large industrial consumers in 28 eastern counties. The rate increases would have totalled $1,073,677 annually. The withdrawal does not affect the proposed upward adjustment of Lancaster County electric rates to bring them in line with those in surrounding counties. Thomas J. Perkins, general counsel for the utility, gave these reasons for the withdrawal: (1) PUC's own investigation in the nine-year-old rate case; (2) complaints filed by 116 electric power consumers; (3) OPA request that no increase be granted; (4) passage of the anti-inflation act prohibiting, with a few exceptions, service company rate increases; (5) the relief granted in the Federal tax bill will enable the company to pay dividends on preferred stock. The Pennsylvania Public Utility Commission authorized withdrawal of the proposed rate increases, but held under advisement the Lancaster County decision.

NORTH CAROLINA UTILITIES COMMISSION decision not to order further Tide Water Power Company rate reductions was criticized by Mayor Hargrove Bellamy of Wilmington, who predicted that the commission's decision and the grounds on which it was based would not go unchallenged. He indicated that neither the city nor the county considered the rate situation closed and that both bodies would continue their efforts to secure both residential and com-

A Needed Guy Attachment

Introducing our new PX89 Pole Eye Plate for attachment of wood strain insulators. Functions similarly on ¾" through-bolt *with insulator* to our well-known P133 Guy Hook *without insulator*, but with two ½" lags instead of one and greater bearing area, 4"x6". On ⅝" through-bolt its rating more closely parallels that of smaller P135 Guy Hook.



Wood strain insulator is attached to PX89 Plate by means of usual ¾" clevis pin or bolt. *Tested* rating with guy at 45° with pole is in excess of 20,000 lbs. If guy approaches the horizontal this rating is reduced to approx. 12,000 lbs., or to approx. 17,000 lbs. if ½" through-bolt is substituted for one lag. Safe working loads would approximate one-half these minimum ultimate ratings.

Swinging clearance is provided for clevis projecting 1½" beyond center of clevis bolt or pin. An adequate curved washer such as our P144, 4"x4"x7/16" thick at boss, should invariably be used on back side of pole, unless two PX89 Plates are used opposed as for storm guy. Compare weight, 380 lbs./C., and cost, 70c ea., with weight and cost of cumbersome pole bands, etc. Note relative simplicity and ease of installation. Already ordered or specified for several important projects.

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mercial reductions. In announcing its decision to neither order a rate reduction nor seek funds from the state's contingency fund for an investigation of Tide Water as had been requested by the joint bodies, the commission quoted liberally from the testimony of H. Zinder, a member of the Federal Power Commission's staff of rate experts, before the commission early last month. "I doubt seriously that the comments made by the Utilities Commission, in connection with Mr. Zinder's presentation will remain unchallenged and I venture to predict that later findings both by the Federal Power Commission and the Securities and Exchange Commission, will reveal many inconsistencies and will fail to substantiate the grounds upon which the North Carolina Utilities Commission rendered their decision," the Mayor declared.

•

Bonneville Energy Will Supply Aluminum Plant

City Council of Tacoma, Wash., has granted consent for use of Bonneville electric energy for power purposes only in the tideflat aluminum reduction plant to be operated by the Olin Corporation.

Municipal officials point out that under the terms of an agreement between City Light and Bonneville authorities reached in 1940, the power could not be furnished by Bonneville without the city's consent. The city is at present unable to furnish enough power for the reduction plant. Bonneville is to supply the power through its own facilities.

•

ASA Issues New List

American Standards Association has announced the publication of its newest list of American standards for 1942. More than 550 American standards are listed, of which 71 represent new and revised standards approved since the last (February, 1942) issue of the list. There is a separate heading for American war standards—standards developed specifically for the war effort.

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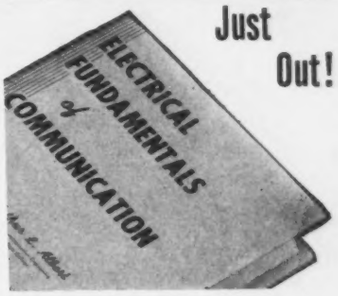

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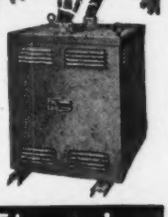

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